ELECTRICAL SOUTH

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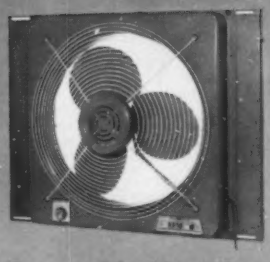

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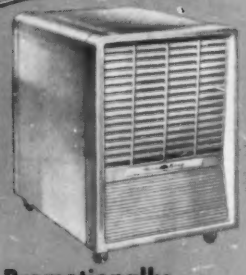

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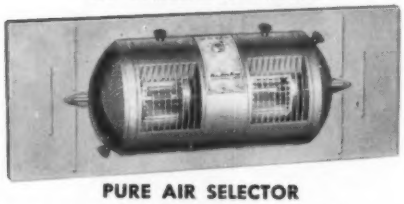

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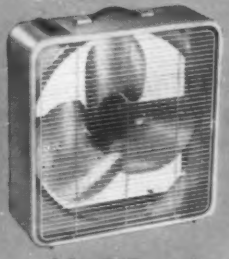

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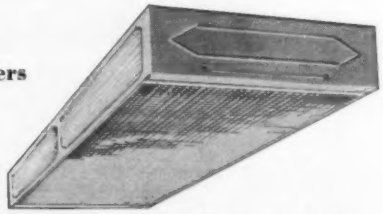

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Psychology and recession

One of the most alarming symptoms of today's economic pattern is the psychological reaction that many consumers are taking to public statements concerning the condition of economic affairs. The health of the economic system may rise or fall on the basis of consumer reactions to public utterances of our leaders.

This column has expressed itself many times upon the importance of the consumer in the maintenance of good economic times. When consumers are buying optimistically, the nation approaches a full employment condition and the economy clicks along merrily. On the other hand, when buyers withhold their dollars from the market, there is bound to be industrial cutbacks to prevent heavy inventory pile-ups.

There is really little that an industrialist can do in the face of buyer resistance other than to fall back upon hard and intensive sales policies. The position of the consumer today is most important in the determination of where this country is going economically speaking.

Election year problems

It is certainly unfortunate that the present market tightness is accompanied by the problems of an election year with all of the irresponsible speeches that are now being heard on every hand. It is also unfortunate that most of the remarks are put forth by politicians eager to improve their personal political fortunes at the expense of national well-being.

In many quarters the remarks of political leaders will be listened to with great confidence by the people who comprise the great consumer market of the nation. Already many are withholding their spendable dollars from the market place in the belief that this practice will ensure better economic conditions for themselves at least. Unfortunately this withholding of purchasing power only intensifies the problem and promotes economic and business doldrums.

Businessmen should speak out

One of the major tasks ahead for the business leadership of the nation is to become more vocal in terms of the economy as he sees it. The top business leaders of the nation, in numerous survey reports, have amply stated and reiterated their faith in the national economic picture.

A survey of most all important signposts (personal income, gross national product, savings for expenditure or investment, consumer needs) all point to an economic picture for 1958 and thereafter that is sound and most productive for the personal well-being of the people as a whole.

There certainly will be readjustments in the economy for specific industries or labor groups, but such are to be expected in any economy based upon the free choice that consumers have in the market place. The values that such an economy have in personal freedom are far greater than the transient difficulties involved.

It is therefore more important than ever before, that businessmen speak out in their own defense and that they call attention to the strengths of business in refutation of the irresponsible remarks of those who may try to make political gain out of economic disruption. This is a sensible course of action for all in business to take because confidence in business is most essential to success in business.

That there is a healthy consumer market available is easy to see. Incomes during the past year reached record proportions. Savings increased to extremely high levels. Manufactured goods, both durables and non-durables, were produced in large quantities in 1957 and for the greater part of the year flowed easily from dealers stocks into household use.

Even the final quarter of 1957 showed real strength to the business world although at a somewhat slower pace than during the major part of the year.

Jobs in industry are available only when goods can be produced *and marketed*. The marketing process can easily grind to a halt if the buying public loses confidence in the future of economic events. This situation must require the concerted efforts of all businessmen to build a higher degree of customer confidence upon *facts* which only those in the practice of business can reliably report.

True facts, properly reported by those in whom the consumer public can place their confidence, are the strongest anti-recession measures that can be taken.

Place of government

The value of governmental opinion at this time is seriously impaired by the political overtones that are present. As a consequence, the various remarks and speeches of President Eisenhower and his lieutenants have lost some of the receptivity that they have enjoyed in the past.

Political clamor for immediate action programs sponsored by the government fails to recognize the strengths that are present in the business picture and tends to play up, out of all logical importance, the incipient weaknesses that can be overcome by proper thinking and action under the free economic system.

The present administration has moved a long way toward the revival of the free enterprise economy that had been over-shadowed by twenty years of depression and war economies. Today's condition is one of the first real tests that the present economic philosophy has received.

What happens now will depend largely upon several factors of great significance:

(1) Consumer confidence at the market place.

(2) The ability of business to speak its piece forthrightly in order to build confidence.

(3) The prospects of a good economic revival without hurried intervention by the government.

The latter action would certainly be indicative that businessmen had failed in maintaining a free economy.

Dr. Bunting is a well-known economist and educator having special knowledge of the South

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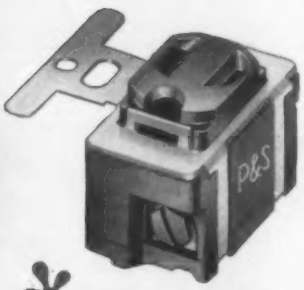

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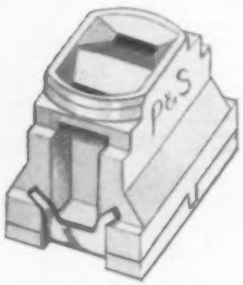

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NISA, Southeastern Chapter. Mrs. Virginia Oehmann, Executive Secretary, 19 N. W. Fifth St., Fort Lauderdale, Fla.

NISA, Electric Motor Service Association of the District of Columbia. John W. Lainhart, Secretary, 913 E. St., NW, Washington 4, D. C.

NISA, Louisville Chapter. W. C. Krauth, Secretary, 118 S. 1st St. Louisville, Ky.

NISA, New Orleans Chapter. William Dreis, Secretary, 1517 Calliope St., New Orleans, La.

NISA, Mid-South Chapter. Murphy G. Miller, Secretary, 109 Jennings Ave., Knoxville 17, Tenn.

NISA, Southwestern Chapter. George Foshee, Secretary, 203 S. Main, Fort Worth 4, Tex.

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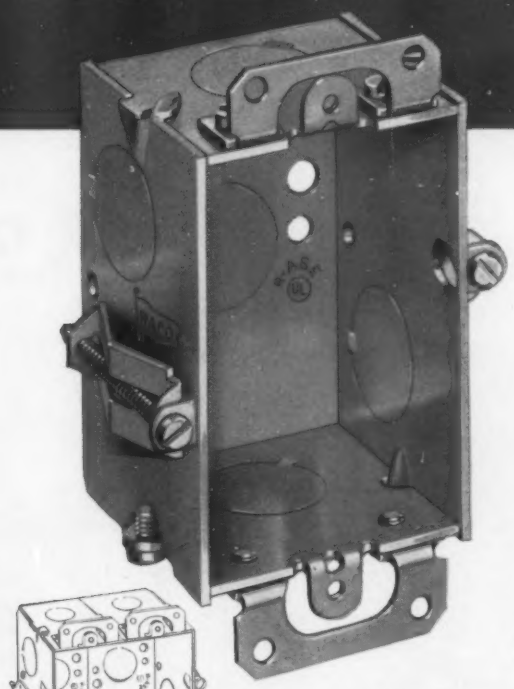
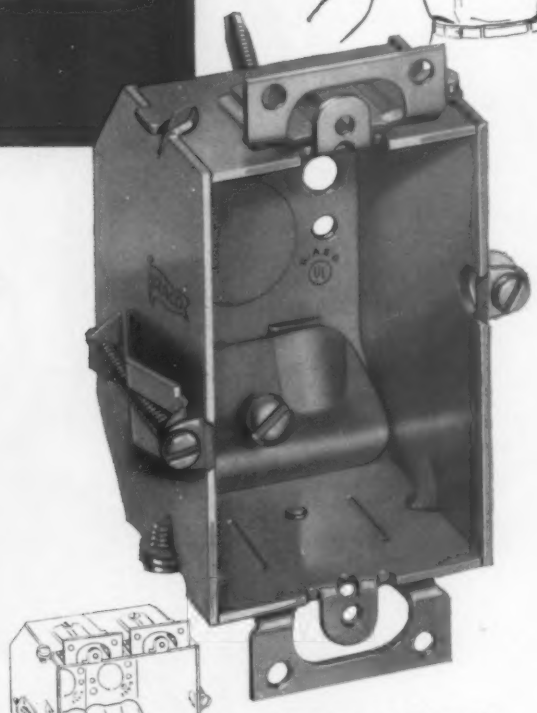
Give Your "Old Work" A Profit Lift with

New RACO GANGABLE GRIPTITE BOXES



No. 425 GRIPTITE
2" Deep
Without Clamps



No. 487 GRIPTITE
2¼" Deep
with Non-Metallic Clamps

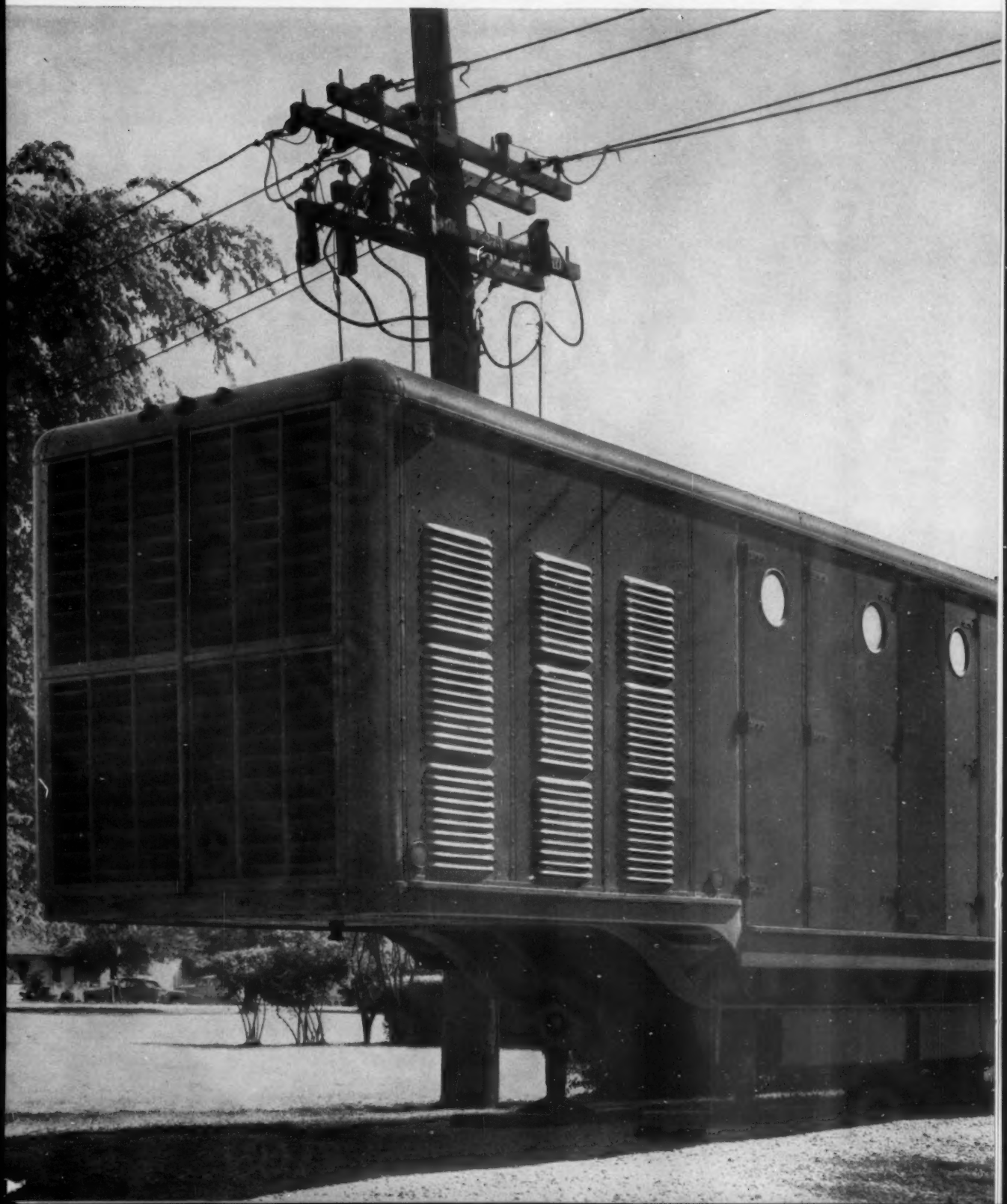
- **GRIPTITES ARE EASIEST TO INSTALL**
- **WORK PERFECTLY IN ANY TYPE WALL—WOOD, WALLBOARD, PLASTER, CONCRETE, BRICK**
- **EXPANSION-ANCHORS FASTEN BOXES SECURELY**
- **2-GANG GRIPTITES IDEAL FOR KITCHEN EXHAUST, CENTRAL AIR CONDITIONING SWITCHES**

You Can Always Rely on Raco

You get fast installation with Raco gangable Griptite boxes. Make old work installations more profitable. Single or ganged, Raco Griptites anchor securely in any type of wall. Next time make a Raco Griptite installation and show a profit on old work!

ASE RACO **ALL-STEEL EQUIPMENT INC.**
AURORA, ILLINOIS

Line relocation



need not be costly

Not, that is, when work can be completed during regular hours and without interrupting service. And many utilities are doing just that—paring the high cost of line relocation and other maintenance and repair needs—with versatile Electro-Mobile generating units.

For example, a 500 kw trailer like the one shown here can travel most anywhere, pick up a load in minutes. Crews can do their work faster, at lower cost, and all the while *normal service* is maintained.

Further, these units can be utilized as an immediate source of emergency power. Their quick mobility can provide the means to continued service, and continued good public relations.

The economies of Electro-Mobile Power have been demonstrated on many utility applications. Why not ask your Electro-Motive representative to outline briefly ways these trailer units can help improve service and lower costs for your system?

1000 kw units for use on sidings or placed on piers for semi-permanent use.

500 kw units offer excellent mobility for many temporary applications.

LIVE BETTER ELECTRICALLY

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

LA GRANGE, ILLINOIS

Sales offices in Chicago, New York, St. Louis, San Francisco
In Canada: General Motors Diesel Limited, London, Ontario

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

1011—Electrical Conduits

"Natural Electric Conduits" is the title of the 30-page Catalog No. 603 which describes and illustrates the many types of electrical conduits that are manufactured by National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.

1015—Squeezon Connectors

The Squeezon, a new compression connector for power lines, is fully described in bulletin "SQ" available from the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo. The Squeezon features greatly increased electrical and mechanical efficiency.

1019—Service Panels

Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

1085—Lighting Fixtures

Eastern presents their most complete catalog, 32 pages of engineered lighting data, including a variety of fixtures for all architectural, commercial and industrial applications. Eastern Fixture Co., Inc., 170 Vernon St., Boston 20, Mass.

1097—Cord Catalog

A complete 48-page catalog is available from the Cornish Wire Co., 50 Church St., New York 7, N. Y. containing all data on flexible and portable cords, lamp cords, heater cords, cordsets, radio and electronic wires.

1103—Compression Connectors

Burndy's new Bulletin CR-1A features the new Crimpit technique for all overhead distribution connections. The bulletin provides information on the entire Cripit line, including details of hydraulic installation tooling and accessories. Copy available from Burndy Corp., Norwalk, Conn.

1109—Anchoring Devices

An illustrated 32-page catalog, No. 65, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

1135—Wiring Devices

Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible need and use in Industrial, Commercial and Residential applications.

1167—Industrial Lighting

A four-page catalog insert is now available from the Multi Electric Mfg. Co., Inc., 4223-43 West Lake St., Chicago 24, Ill. The leaflet describes Multi's line of lighting equipment and wiring devices, which include floodlights, vaporproof fixtures, and fluorescent and incandescent fixtures.

1197—Convenience Outlets

Bulletin gives complete information on the new P&S No. 500 for adding extra outlets to existing installations. Everything you need in a single package—no steel boxes required. Available from Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y.

1209—Fluorescent Ballasts

Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

ELECTRICAL SOUTH
806 Peachtree St., NE
Atlanta 8, Ga.

March, 1958

Gentlemen:

Please send me the bulletins and catalogs indicated.

(Print Plainly)

Name ..... Title .....

Company .....

Address .....

City & State .....

Circle numbers below. Bulletins and catalogs will be mailed promptly.

1011	1015	1019	1085	1087
1097	1103	1109	1135	1167
1197	1209	1233	1237	1253
1257	1259	1261	1263	1265
1267	1269	1271		

with National Electric Xduct Junior, E.M.T.

Only high ductile steel is used in the manufacture of Xduct Junior, E.M.T. The result—you can make bends easily without using excessive pressure. In addition, you'll find that properly handled, Xduct Junior does not flatten and the tight finish will not flake or crack. Good bending is just one Xduct Junior feature. You also get—

Easy Fishing—Xduct Junior has a baked-on inside coating of aluminum enamel that holds friction between conduit walls and wires to a minimum.

Corrosion Protection—National Electric's revolutionary process of electrogalvanizing deposits pure zinc uniformly over the entire outside surface of the E.M.T. . . . assures high resistance to corrosion.

If you're looking for fast installation and complete wiring protection, try National Electric Xduct Junior on your next job.

A screwdriver is all you need with National Electric E.M.T. Fittings

The outstanding holding action of these fittings is obtained when the patented embedding screw is driven home in the tubing wall. Actual tests prove the connection is a vibration-proof bond that won't break or loosen unless the screw is purposely released.

Patent No. 2,455,180

For Dependable Pathways of Power

National Electric Products

PITTSBURGH, PA.

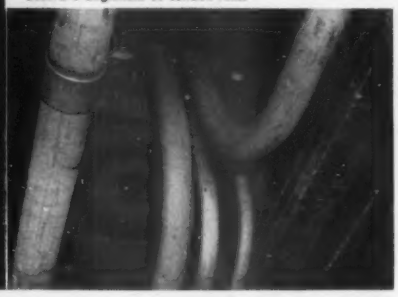
2 Plants • 12 Warehouses • 41 Sales Offices

new... fast...

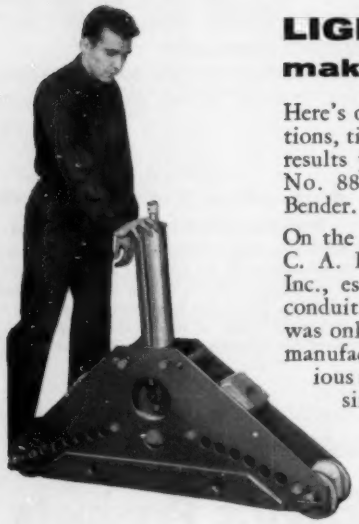
HIGH-POWERED BENDER

for PIPE and CONDUIT up to 4"

Typical 90° bends made with one ram stroke of a GREENLEE Bender on the job of Rockford Industries, Inc. A total of 500 bends in 1¼" through 3" conduit were made for this new plant installation with fast, portable GREENLEE Hydraulic Benders. Note smooth appearance, accurate alignment of conduit runs.



GREENLEE No. 884 Hydraulic Bender at work on new National Lock Company Plant job by Rockford Industries, Inc., electrical contractor, Rockford, Ill.



LIGHTWEIGHT GREENLEE No. 884

makes full 90° bend with one ram stroke

Here's on-the-job proof of the cost reductions, time savings, and better installation results you get with the new GREENLEE No. 884 Hydraulic Pipe and Conduit Bender.

On the job, illustrated above, Supervisor C. A. Pottinger of Rockford Industries, Inc., estimates that the cost of making conduit bends with the GREENLEE No. 884 was only about one third of that of using manufactured bends. Bending of the various sizes of conduit needed was fast and simple. *Ability to make a 90° bend with one ram stroke and minimum setup time meant big time savings.* Easy wheeling of this lightweight bender to many locations and easy insertion and removal of the conduit from the front of the bender added extra efficiency to the job.

Make your installations go faster, too, at less cost with this powerful new GREENLEE No. 884 Hydraulic Bender. Makes a full 90° bend *in 4-inch pipe* in only *4 minutes* when operated with the GREENLEE Power Pump shown above. Handles 10 sizes of conduit from ½" through 4" . . . only *one* pipe support needed for all sizes. Fast, easy to operate, lightweight, portable . . . one of the most important equipment investments you can make today!

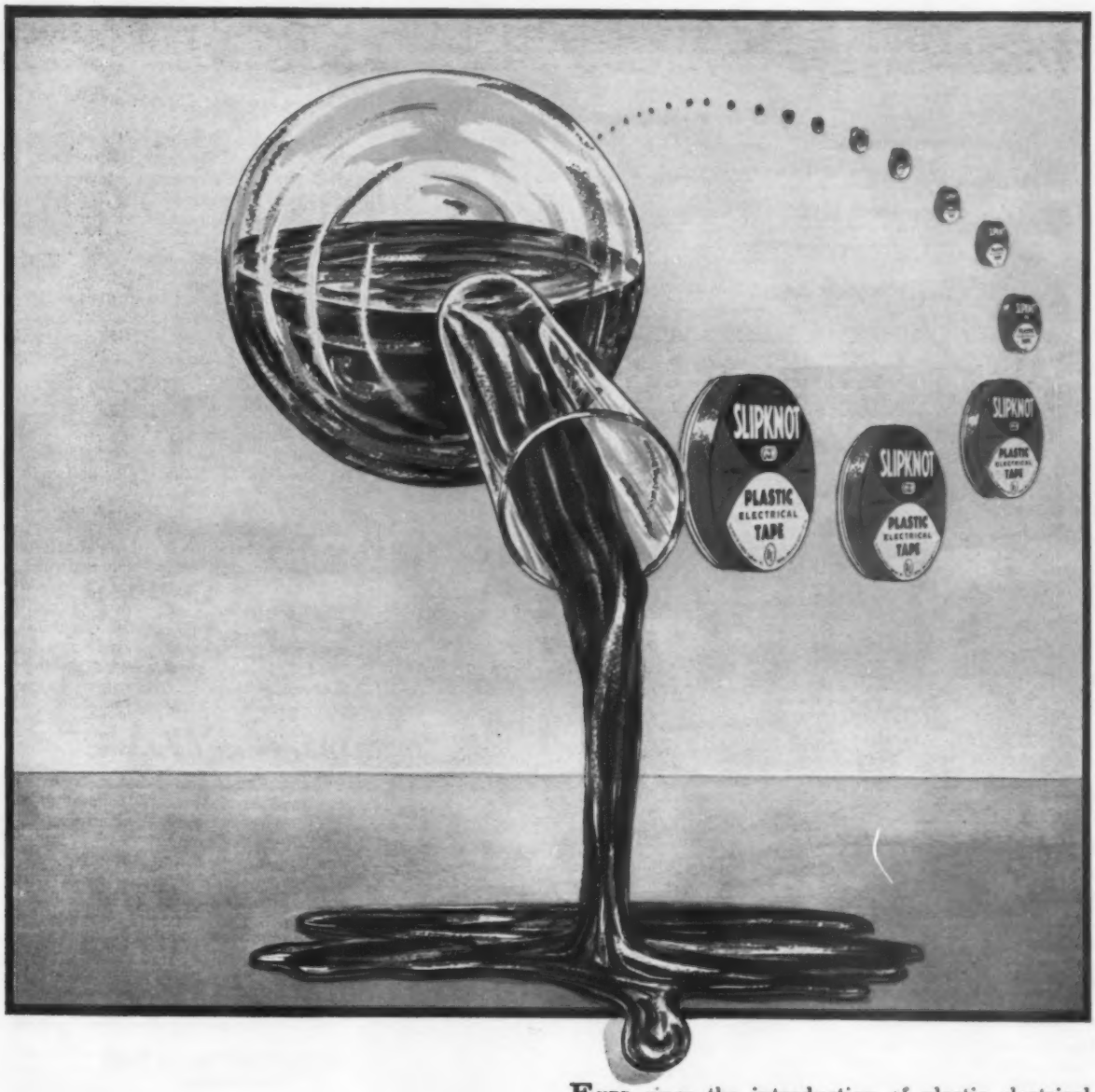
SEE YOUR ELECTRICAL DISTRIBUTOR

for the complete story on this advanced new bender that speeds jobs, cuts costs. Or write direct for new descriptive Bulletin E-224.

TOOLS FOR CRAFTSMEN

GREENLEE

GREENLEE TOOL CO., 1783 Columbia Avenue, Rockford, Illinois



ZF·90

MAKES THE DIFFERENCE

EVER since the introduction of plastic electrical tapes, a major problem has been to keep the tape from creeping, and the adhesive from stripping off the base. A plastic tape with imperfectly bonded adhesive means trouble, as your experience with ordinary plastic tapes may have shown.

Plymouth's research laboratories have solved this problem with ZF-90 — proven formula for *total adhesion* — molecular fusion of special adhesive to vinyl base — to produce SLIPKNOT #7 PLASTIC ELECTRICAL TAPE. It *molds totally* around any job. The adhesive *cannot* be separated from the base, and therefore *will not dry out.*

Once you try new SLIPKNOT #7, you'll *know* you can *depend* on it. *Specify* it from your distributor.

SOLD ONLY THRU RECOGNIZED WHOLESALERS

PLYMOUTH RUBBER COMPANY, INC.

Makers of SLIPKNOT FRICTION TAPE

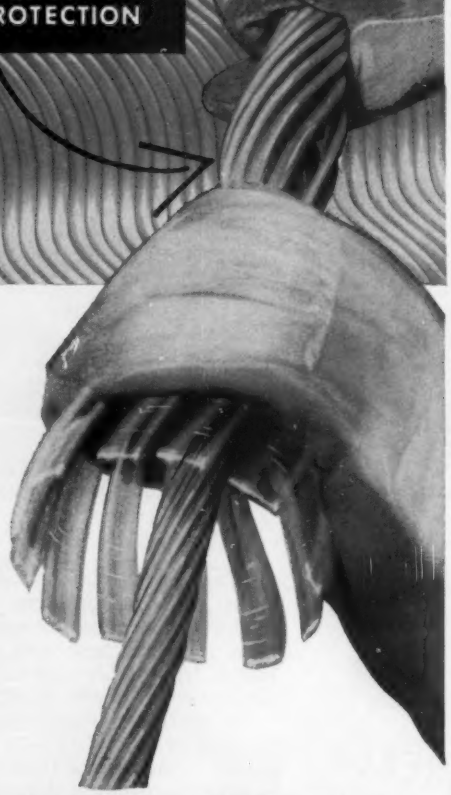
DIVISION 13 CANTON, MASSACHUSETTS

FANNER ARMOR RODS with the Superformed Spiral provide

EASIER FIELD INSTALLATION

GREATER GRIPPING STRENGTH

LONGER-LASTING PROTECTION



• EASIER FIELD INSTALLATION

"Superforming" of special spring-type wire at factory into uniform spirals that snap perfectly into place by hand without the use of tools . . . eliminates costly, haphazard field fabrication of armoring.

• GREATER GRIPPING STRENGTH

The "close-pitch" spiral of *"Superformed"* Armor Rods winds around conductor developing a permanent non-slip full length grip that is stronger and tighter than made by any other method of armoring.

• LONGER-LASTING PROTECTION

"Superformed" Armor Rods reduce conductor strain...prevent conductor pitting and wear . . . eliminate hazards of end clamps.

To get the best — specify Fanner *"Superformed"* Armor Rods. Get acquainted with the important savings they offer by writing for descriptive literature today.

CENTER-MARKED, COLOR CODED AND PACKED IN CONVENIENT CARTONS

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PLASTIC FANNGUARDS · PLASTIC INSULATING TUBINGS AND MOLDINGS

Enter Code Numbers of Catalogs Desired on Coupon on Page 10

1233—Troffer Catalog

A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

1237—Wireholders

Knox Porcelain Corporation, Knoxville 1, Tenn. has recently redesigned a one-piece metal base style reinforced wireholder, No. 5009. Base and screw are hot dipped galvanized. This wireholder has extra sharp threads and quick starting point to make driving easy. KNOX manufactures a complete line of Porcelain Wireholders, House Brackets, Service Entrance Mast Kits and Accessories and other Secondary Service Materials.

1253—Power Connectors

A completely new catalog (No. 526) of power connectors and bus support clamps is now available from Southern States Equipment Corp., Hampton, Ga., superseding catalog No. 525-R. Furnished in a handsome 7-ring binder, the new catalog includes sections on bus support clamps, couplers and angle braces, bar connectors, Tee connectors, stud connectors, ground connectors, parallel clamps, and terminals.

1257—Centrifugal Roof Ventilators

An 8-page, two-color folder (SDA-220) giving construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

1259—Electrical Tapes

Twelve pages of specifications and application data make up an attractive booklet on Dutch Brand Electrical Tapes. Plastic, friction, and rubber tapes, as well as a vinyl tape made in nine different colors, are available from Dutch Brand Division, Johns-Manville, 7800 So. Woodlawn Ave., Chicago 19, Ill.

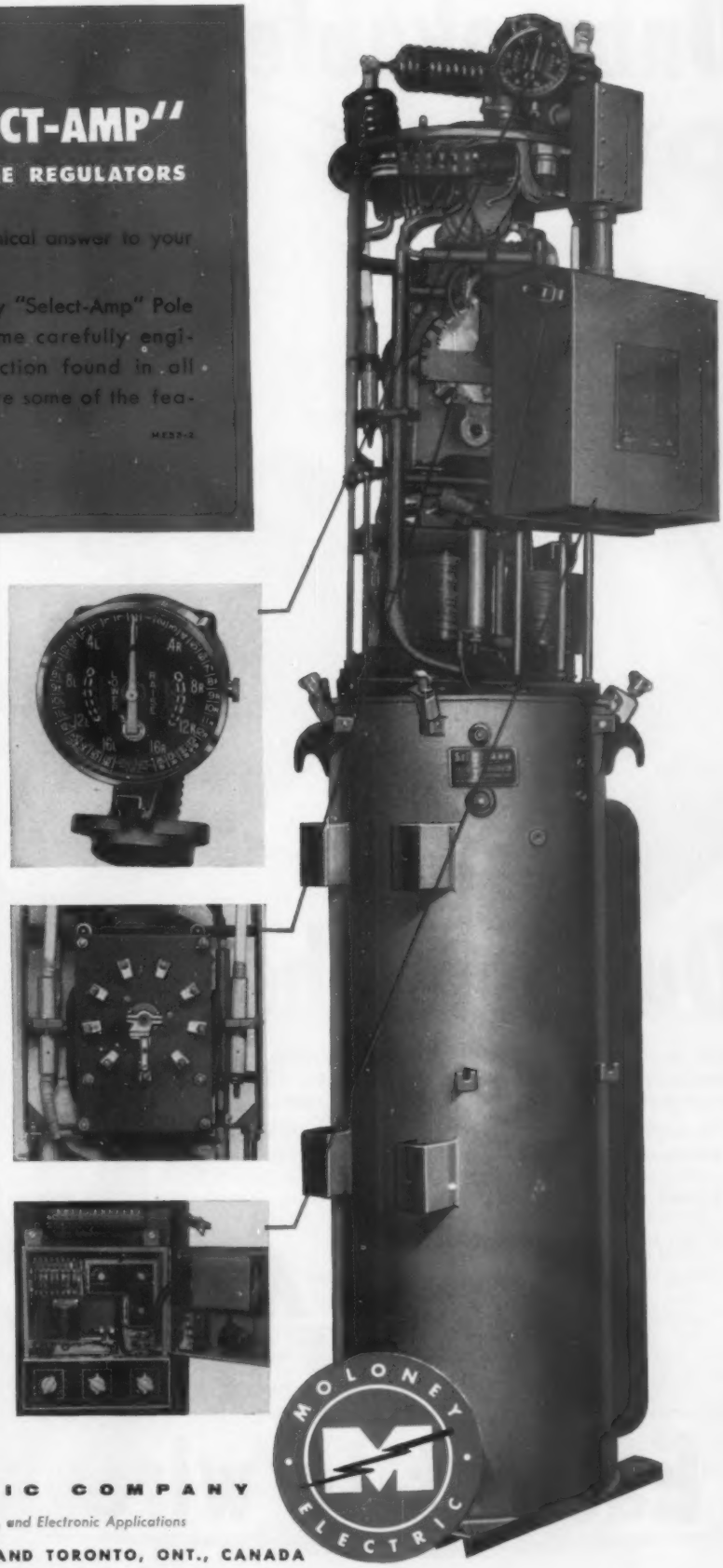
MOLONEY "SELECT-AMP"

POLE TYPE STEP VOLTAGE REGULATORS

. . . provide an efficient, economical answer to your voltage regulation problems.

The component parts of Moloney "Select-Amp" Pole Type Regulators have the same carefully engineered, high quality construction found in all Moloney transformers. Here are some of the features of this regulator . . .

M252-2



"Select-Amp"—The Moloney "Select-Amp" feature is controlled from the position indicator and allows the range of voltage regulation to be adjusted from a maximum of plus or minus 10% to a minimum of plus or minus 5%. Reducing the range of regulation to plus or minus 5% permits increasing load current to 160% of normal rating. The voltage is raised or lowered in ⅝% steps.

Position Indicator—is directly coupled to the drive mechanism. Resetable drag hands on the position indicator indicate the highest and lowest position the regulator has reached. These drag hands may be reset by operating the reset lever with a hook stick. The position indicator is mounted at an angle to facilitate observation of indicator from the ground.

Moving Contact Assembly—consists of arc-resistant copper tungsten contacts contained in beryllium copper clamps, aligned with beryllium copper springs and compressed with coil springs to obtain correct contact pressure. A spring loaded accelerator provides "quick-break", "quick-make" action to all switching, thereby minimizing arcing time, consequently reducing contact wear.

Stationary Contact Blade—is made of copper chrome alloy and is tipped with copper tungsten to minimize arc erosion.

Mounting Panel—is made of heavy bakelite to provide an insulating panel for mounting the switch contacts.

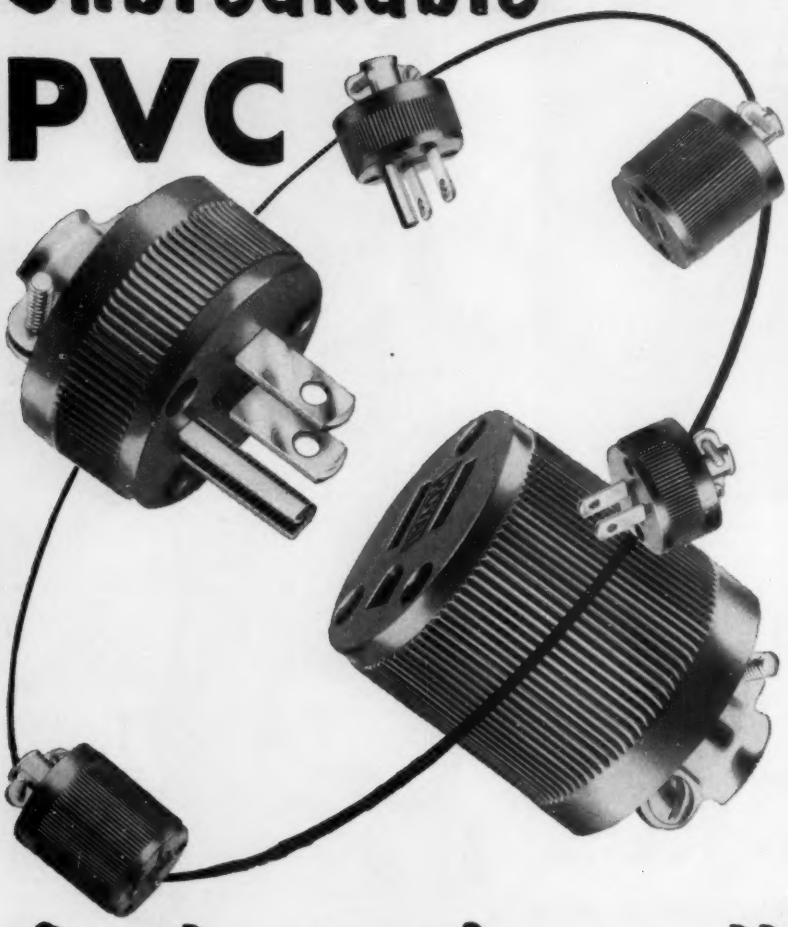
Control Cabinet—The hinged front cover is gasketed and is secured by toggle clamps thereby affording both weather-proofing and accessibility. The toggle clamps are provided with padlock eyes so that the cabinet may be locked to prevent tampering. The cabinet is bolted to brackets on the tank wall and may be removed for mounting at the base of the pole.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Unbreakable PVC



Outlasts them all

Make up your extensions and power supply cords with ROYAL PVC Heavy Duty Grip Caps and Connectors—the all-vinyl molded devices, with blades and contacts locked in solid vinyl— built to take punishment and come back for more.

No other caps and connectors have so many years-ahead engineering features:

- **Unbreakable, molded-in construction.** They don't need costly armor because they're made of unbreakable vinyl — cannot crack, chip, or break.
- **Dead front caps.** There are no washers and no exposed wires to short. PVC devices set new standards for safety and ease of wiring.
- **One-piece connectors.** No eyelets or rivets to work loose or fall out.
- **Tops for every service.** Give PVC devices a real beating — expose them to oil, grease, acid — no other devices can match their performance and durability.

Order PVC from your wholesaler, today. Or, write for Catalog 2-3-57 and a free sample, giving us your wholesaler's name. **Royal Electric Corporation, Pawtucket, R. I.**

ROYAL ELECTRIC
AN ASSOCIATE OF ITT

Easiest to wire

Enter Code Numbers of Catalogs Desired on Coupon on Page 10

1261—Cable Puller

The electrically powered cable puller manufactured by The Barth Corp., 12650 Brookpart Rd., Cleveland 30, Ohio, is described in a new booklet. This tool is ideal for industrial and commercial construction and maintenance.

1263—Conduit Fittings

Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packaging details are included.

1265—Wire and Cable

Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

1267—Guy Strand

An Engineering Data Sheet—E. D. 1878—describing the new Copperweld Type M Guy Strand. Contains table of physical properties as well as instructions for dead-ending this new high-strength, non-rusting guy strand. Available from Copperweld Steel Company, Frick Building, Pittsburgh 19, Pa.

1269—Hydraulic Power

A new bulletin describing the two-speed, fast-approach portable power for hydraulic tools obtainable from hydraulic power pumps is offered by Greenlee Tool Co., of Rockford, Ill.

1271—Power-Strut Channel

Three new bulletins have been issued containing specifications and application data on Power-Strut channels and related devices manufactured by Power-Strut, Inc., Framingham, Mass. No. 550 describes its use as surface raceway and lighting support; No. 560, electrical cable and duct supports; 580, movable Power-Strut walls.

Here's how Roebling VCV works!

1 Strand wrapped in semi-conducting tape goes up through 4-story, high-temperature tube. This drives out gases and moisture from core, and preheats the conductor for more uniform curing.

2 Conductor is put under controlled tension, which is maintained during entire insulating process.

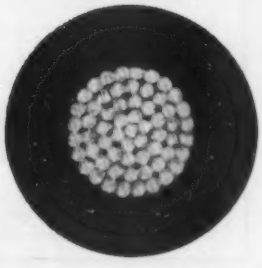
3 Butyl insulation is extruded downward around conductor.

4 Vulcanization takes place continuously and uniformly in vertical tube. Constant high steam pressure assures dense, sound insulation.

5 Insulation never touches anything until high-pressure water cooling is complete. The result is unvarying roundness, smoothness and concentricity of butyl insulation.

ROEBLING

VCV



The Conductor is Always Dead Center

ROEBLING'S 15 KV CABLE HAS UNIFORMLY HIGH CORONA LEVEL AND DIELECTRIC STRENGTH. VERTICAL CONTINUOUS VULCANIZATION ASSURES UNUSUALLY LONG TROUBLE-FREE CABLE SERVICE.

If you sliced a length of Roebling's VCV 15 kv Cable into cross sections, you'd find that *every inch* is uniform, every inch is round, and in every inch the conductor is exactly centered!

VCV is responsible for the exceptional quality of this new high-voltage cable. No longer will you buy cables in which the conductor has "snaked," or that has flattened, scraped, blistered or abraided insulation. Because insulation is the same thickness and density for the length of the cable, dielectric strength and corona level are uniformly high.

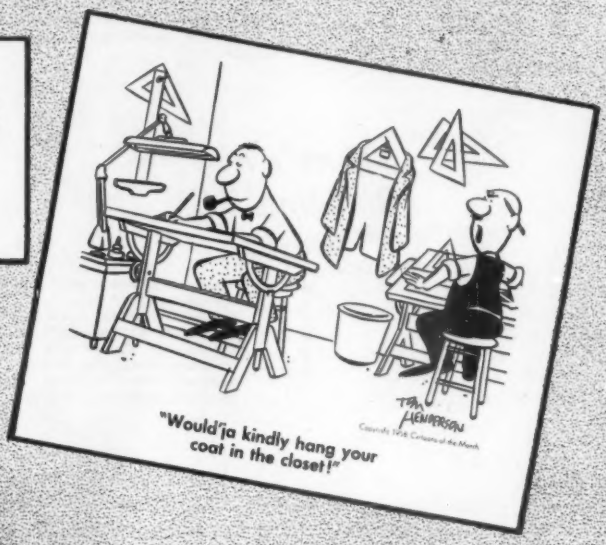
ROEBLING VCV 15 kv CABLES
are available in a complete range of conductor sizes and insulation thicknesses

Write today for more facts about the longer, better service you'll get with Roebling VCV High-Voltage Cable. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

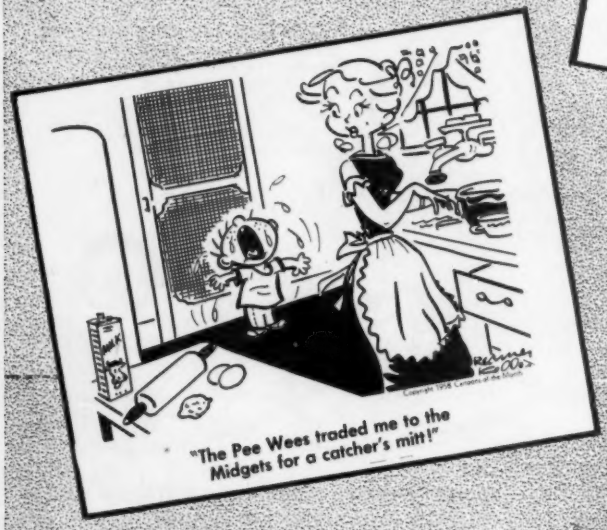
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

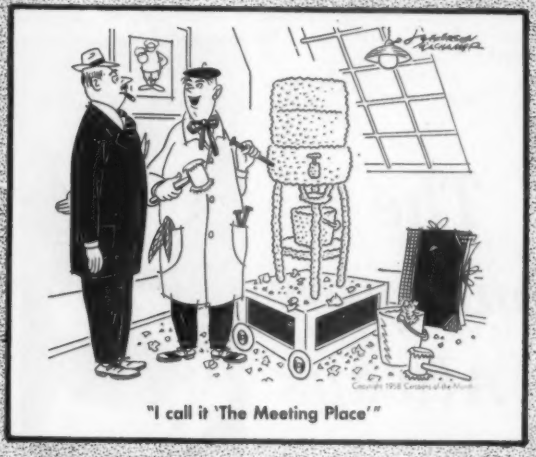
Your Work Can Wait!



"Would'ja kindly hang your coat in the closet!"

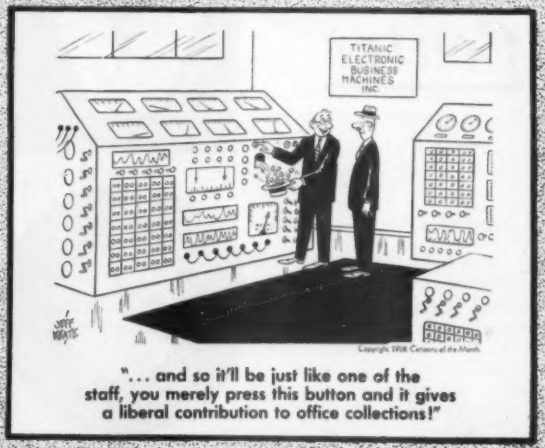


"The Pee Wees traded me to the Midgets for a catcher's mitt!"



"I call it 'The Meeting Place'"

"Well, I certainly didn't make all those mistakes! There must be a short circuit in the electric typewriter!"



"... and so it'll be just like one of the staff, you merely press this button and it gives a liberal contribution to office collections!"

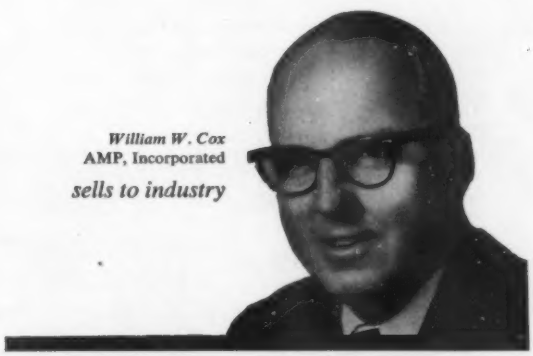
Can specialized business publication advertising actually sell?

By reputation, salesmen are reluctant to credit anything but their own selling efforts for getting names on the dotted line.

Actually, it's quite a different story. The most successful salesmen will tell you two important things about selling. 1. That the selling process is largely a matter of communicating ideas. 2. And that specialized business publication advertising can help importantly to register information with prospects.

Of course each salesman will express this in his own way ... but they all agree that selling would be far more difficult without the advertising that appears in the industrial, trade, and professional publications that serve the specialized markets to which they sell.

Here, for instance, is what a salesman has to say about this kind of advertising:



William W. Cox
AMP, Incorporated
sells to industry

Says Mr. Cox:

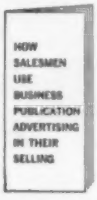
"The quickest way we can introduce a product is by introducing it through advertising in business papers. That way we get it around faster than we can by word of mouth alone. On occasion my home office has inquiries out to me before I can get to the customer or prospect to introduce a new product. They've already seen it in a trade magazine.

"It's interesting to note that within the last two weeks I received a survey which shows about 80% of the new customers we get on our books come through our trade publication advertising. Of course, our company is only 15 years old and we have grown from what you might say, *nothing*, to the biggest in our business. Certainly a lot of that has come from our advertising campaigns. Our name is known throughout the world right now, purely because of our advertising program. When I go to a prospect now, they know my company, they know my product ... it makes my job easier, and opens doors when I have to make cold calls."

Ask your own salesmen what your company's business publication advertising does for them. If their answers are generally favorable you can be sure that your business publication advertising is really helping them sell. If too many answers are negative it could well pay you to review your advertising objectives—and to make sure the publications that carry your advertising are read by the men who must be sold.

How salesmen use their companies' advertising to get more business

Here's a useful and effective package of ideas for the sales manager, advertising manager or agency man who would like to get more horsepower out of his advertising. Send for a free copy of the pocket size booklet entitled, "How Salesmen Use Advertising in Their Selling," which reports the successful methods employed by eleven salesmen who tell how they get more value out of their companies' advertising.



You'll find represented many interesting variations in how they do this. Some are very ingenious; all are effective. You can be sure that more of your salesmen will use your advertising after they read how others get business through these simple methods.

The coupon is for your convenience in sending for your free copy. Then, if you decide you want to provide your salesmen with additional copies, they are available from NBP Headquarters in Washington, at twenty-five cents each. Or if you choose you can reprint the material yourself and distribute it as widely as you please. But first, send for your free copy.

NATIONAL BUSINESS PUBLICATIONS, INC.
Department 4D
1413 K Street, N. W.
Washington 5, D. C. **STerling 3-7533**

Please send me a free copy of the NBP booklet "How Salesmen Use Advertising in Their Selling."

Name _____

Title _____

Company _____

Street Address _____

City _____ Zone _____ State _____

National Business Publications, Inc.

NBP

... each of which serves a specialized market in a specific industry, trade or profession.

New Dayton Daily News Building Gets Life-time Wiring Protection With

YOUNGSTOWN "BUCKEYE" STEEL CONDUIT

Electrical wiring system in the new Dayton Daily News Building will be permanently safe from damaging elements such as water, moisture, vapor, dust and dirt because Youngstown's Full Weight Rigid Steel "Buckeye Conduit is on the job 24 hours a day—every day.

If the safe and efficient operation of your electrcial systems—in any location— poses a problem, then Youngstown "Buckeye" Conduit should be your specification. Field reports relate: "It's easier to bend and thread—easier to fish wires through and because of its superior corrosion resistance, provides a much longer, trouble-free service life."

Remember, because Youngstown is the only producer of rigid steel conduit controlling all processes from ore mining to finish threading, you can be certain each length contains the same high quality that has made it the accepted standard of leading owners, architects and contractors everywhere.

Our Distributor's complete and ample stocks will help keep your jobs on schedule—and cover emergency needs whenever they arise. Why not call today for prompt and efficient handling of your next conduit order.

Dayton Daily News Building, Dayton, Ohio
Design and construction by The Austin Company, Cleveland, Ohio
Electrical Contractor: The Wagner-Smith Company, Dayton, Ohio
Conduit Supplier: Westinghouse Electric Supply Co., Dayton, Ohio

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

An improved
Combination Starter
for extra safety

While the changes in the new Allen-Bradley Bulletin 712 and Bulletin 713 starters may be relatively minor, they were made in your interest—to give you the best control on the market.

The new operating lever has been attractively restyled and structurally improved. Now the disconnect switch can be locked "open" or locked "closed"—with three padlocks of any kind. For the maintenance engineer, a concealed latch pin is built into the lever, which permits opening the door of the cabinet without opening the disconnect switch and stopping the motor. The door can also be padlocked shut independently of the operating lever.

With the disconnect lever in the "off" position, the cabinet door can be opened. At a glance, it can be seen that the movable contacts are open. An added "safety" feature—the incoming line connections are covered with an insulating plate to prevent accidental contact.

Allen-Bradley Co., 1305 S. First St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

CONSULT YOUR LOCAL ALLEN-BRADLEY REPRESENTATIVE

ATLANTA—W. R. Calverley, 1000 Peachtree St., N. E., P. O. Box 7086, Sta. C., Tel: TRinity 6-8833
BALTIMORE—H. M. Wood & Co., Inc., 124 Light St., Tel: MUlberry 5-4643-4
BIRMINGHAM—J. L. Howarth Co., Inc., 825 S. 22nd St., Tel: FAirfax 3-1171
CHARLESTON—Henry E. Payne, 918 Kanawha Blvd., E., Tel: Dickens 3-1393
CHARLOTTE—LeRoy P. Spoon, 307 Lincoln St., Tel: EDison 4-6334
CORPUS CHRISTI—Wilson Electrical Equipment Co., P. O. Box 9004, Tel: TUlip 3-2831
DALLAS—J. K. Webb, 2810 McKinney Ave., Tel: TAylor 3-6179
HOUSTON—Wilson Electrical Equipment Co., 3210 Garrow Ave., Tel: CApitol 8-1557
JACKSONVILLE—Robert P. Smith & Co., 1446 June St., Tel: EXbrook 8-0531
KANSAS CITY—B. L. McCreary & Son, 1819 Central St., Tel: HArrison 1-1668
KNOXVILLE—Bowditch & Co., 1311-C N. Broadway, P. O. Box 3145, Tel: 4-2513
LITTLE ROCK—Curtis H. Stout, Inc., 400 Shall St., P. O. Box 107, Tel: FRanklin 4-8201
LOUISVILLE—Rietze & Co., 2209 S. Floyd St., Tel: MEtrose 7-3603
MEMPHIS—Curtis H. Stout of Tennessee, Inc., 718 M & M Bldg., Tel: JAckson 6-7601
MIAMI—Charles R. Lee & Assoc., Inc., 3524 W. Flagler St., Tel: FRanklin 1-6766
NEW ORLEANS—Robbins & Robbins, 1037 Magazine St., Tel: Canal 5805
RICHMOND—H. M. Wood & Co., Inc., 2016 Second Ave., Tel: 3-8529
ST. LOUIS—Harold Julien, 904 N. Grand Blvd., Tel: JEfferson 5-1901
SAN ANTONIO—Wilson Electrical Equipment Co., 101 E. Maple St., CApitol 4-2344
TAMPA—Robert P. Smith & Co., 3611 So. Coolidge Ave., Tel: 61-5211
TULSA—John W. Elder Co., 1526 E. Fourth St., Tel: Diamond 3-9149

"THE ONLY EXTRA WAS IN THE CAPACITY"

When Detroit Brewer Powered-Up with New Type LD Transformers

When The Stroh Brewery Company of Detroit needed extra electrical capacity for their bottle shop, consulting engineers Harley, Ellington and Day recommended that they POWER-UP their private "substation on a rooftop." In the past, Stroh would have been faced with the almost certain expense of expanding their substation area and increasing structural reinforcing of the roof to accommodate larger and heavier transformers.

But new Westinghouse Type LD transformers are smaller and lighter. Their new circular design, with the coolers on the back only, saves up to 37% in width and base area over a Westinghouse Type SL unit of the same rating. The three 250-kva Type SL's which the brewery had outgrown were replaced with three 333-kva Type LD's—and *no extra space was needed.*

The weight problem, too, was eliminated by the compact design. Cooling oil weight is reduced over comparable Type SL units, with an overall weight reduction up to 27%. *No extra reinforcing was necessary* for the higher ratings installed in this rooftop site.

As a Stroh spokesman said of the installation: "No extra space; no extra reinforcing; the only extra was in the capacity."

* * *

Call your Westinghouse representative for the full story of how the new, streamlined Type LD transformer can help solve *your* customers' space and weight problems . . . and help them POWER-UP with capacity for their growing demands. J-70863

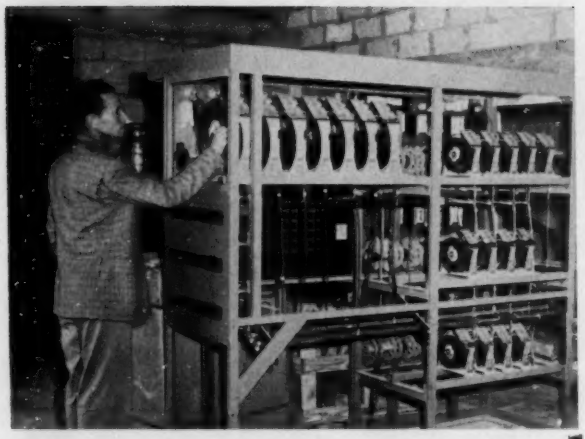
▲ NO EXTRA SPACE WAS NEEDED when these 333-kva Westinghouse Type LD transformers, on the left, replaced three 250-kva Type SL units similar to the units installed at right.

◀ Circular design tank and core-coil assembly are contour-fitted to provide maximum capacity in minimum space. New Lowgrocap* windings provide maximum impulse strength.

*Trade-Mark

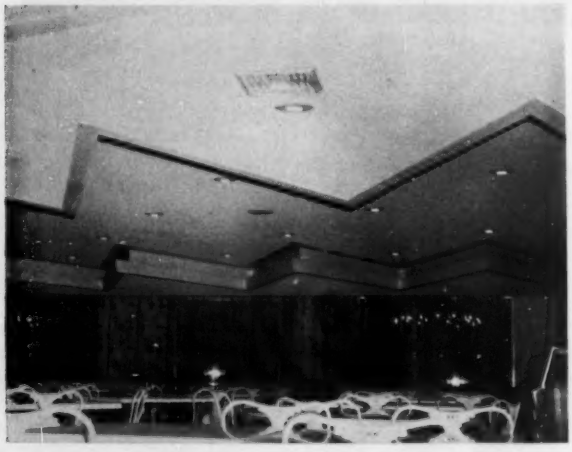
YOU CAN BE SURE...IF IT'S

Westinghouse



Dimmer bank for stage performances in supper club.

22½ kw outlets serve electric ranges in kitchen.



Ceiling design incorporates decorative lighting.

Elaborate chandeliers were assembled on the job.

Contractors faced multiple

By Hal M. Newsome

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers
- Consulting Engineers ✔

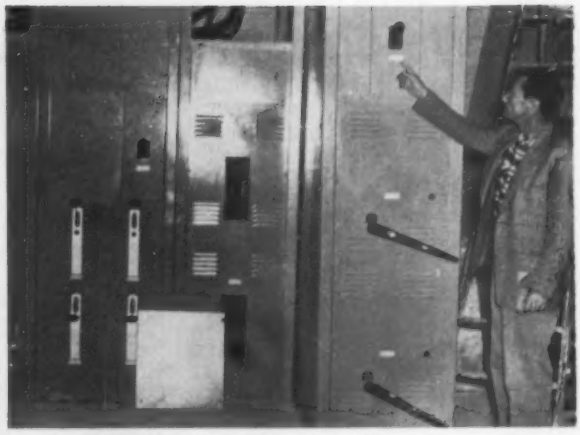
◆ ALMOST ALL electrical contractors know what it means to have "the plans changed" after a contract has been figured or the work started—and how it sometimes takes every bit of his experience, resourcefulness, tolerance and patience to straighten out the job *and* the numerous people involved.

But very few have had the experience—as has the B & W Electric Co., of Miami—of working on a hectic half-million-dollar total electrical installation which was changed so often and completely that the final system had to be put in without the benefit of any designer's completed plan. The contractor's engineering department had to make the plan and the layouts as the job went along, and the original projected modest "Country Boy's Hotel" eventually grew "like Topsy" in the huge fourteen-floor 640-room Carillon, one of the largest hostelries on Miami Beach.

It is considered a tribute to Harold Silvers' B & W Electric, to Bert Winkler, their estimator-engineer, and to Frank Adam, Westinghouse, and other suppliers, that despite all obstacles the finished installation is a sound and efficient one—and also that it was completed just in time for the opening of the winter tourist season in December.

Probably the greatest *single* accomplishment was that of Frank Adam Electric Co., and Bryan Fisher, their Miami representative, in flying the specifications to St. Louis for the fabrication of the special main switchboard which was delivered on the job within exactly ten days of the date that

Basement panel supplies power for lower lobby.



Main panel unit was delivered ten days after order.

Lamperas Quesada designed this leaf-like fixture.

Seymour Lighting supplied bell-type canopy units.

changes on $½ million job

the eventual size and capacity was determined. It was designed in sections for separate installations in different rooms.

The B & W electrical contract ran about $400,000 with extras, but the special and standard fixtures and the wiring of the 24 retail stores included on the ground floor boosted the total electrical cost to well over a half million. The bulk of the fixtures were installed by Seymour Lighting and the special decorative fixtures for the public areas by Lamparas Quesada Sales Corp., both of Miami.

24 hours for roughing-in

In the beginning, the plan called for a severely-simple moderate-rate "country" hotel with a minimum of public space, no fancy dining rooms, night clubs or special luxury-type features. However, more ambitious ideas, introduced successively by subsequent lessees, resulted in a continuous expansion of both size and facilities—and all under a close completion deadline resulting in many thousands of dollars of overtime work. Steel and cement for some of the floors went up almost overnight and the electrical contractor was given one 24-hour day to get the rough wiring in, ready for the plasterers the next morning.

Some idea of the size of the whole job, and of the amount of expansion and dislocation caused by successive new plans, can be gained by the following: Original plans called for 6,000 amps, whereas the total connected load turned out to be 14,000 amps; "One dining room and one kitchen" turned into four of each; "24 outside receptacles" were increased by four or five hundred more outlets for outside lights and signs; the owners added a complete theatre, a combination convention hall and elaborate supper club room complete with adjoining kitchen, and other facilities in proportion.

About 40,500 man hours of electricians' labor (much of it overtime), over a million feet of wire supplying more than 12,000 outlets, and 500 feet of 3-phase 4-

wire aluminum bus duct, went into the installation. Aluminum duct was used because it was easier to get quick delivery of this metal. The duct runs about 20 per cent oversize compared to equivalent-capacity copper but cost around 10 per cent less.

112-hour work week

For the final four weeks of the big rush, 100 electricians worked sixteen hours a day, seven days a week, with individual pay checks before taxes running over $600 weekly. Both B & W supervisors and the inspector practically had to "live on the job" during this period.

There were no complicated technical problems, but personnel and human-relations angles were abundant, and the circuits had to be laid out fast.

Two shop men were on duty full-time to issue materials and tools. Eight foremen worked under B & W's general superintendent Arthur C. McGraner, with Joe Cole as job superintendent. Despite the many changes there was a minimum of material wasted, and all equipment changes were caught in time to re-order before any units were actually delivered.

A dimmer bank was added to the supper club lighting at the last minute permitting the illumination to be cut down for stage performances while still retaining some general lighting for guests and waiters.

Extra capacity available

When TV star Jack Parr was scheduled for a midwinter telecast series from the hotel, the reserve capacity of the switchgear and wiring was sufficient to supply the extra 1,000 amps of 3-phase service which was needed. Most existing hotels would have been unable to add this extra load without remodeling their systems. All Carillon circuits are over-coppered to permit 25 per cent more load if required, and ample panel capacity affords adequate flexibility for the foreseeable future.

One of the most interesting features of the system is a special housekeepers' panel board with individual lights on special circuits for each room in the hotel, so that the desk clerks can tell at a glance which rooms have been "made up" ready for occupancy. This $10,000 custom unit, designed and made by Admiral Corp., is believed to be the only one of its kind and is certainly unique in this area. The maids operate a small plug receptacle in each room to activate the master panel downstairs, and the system speeds up guest check-ins by 50 per cent—a big item in handling scores of travel-weary people in the busy season.

The main switching equipment consists of eight 1600-amp shunt-trip circuit breakers all interrupted by one push button. The Miami code permits only *five* main switches—but by putting all "8 mains" under a single control, code conformance was secured. Two extra 600- amp "emergency" breakers permit the elevators and all emergency lighting to operate even when the main breakers are open.

Standard 36-circuit panels, two of each for every floor of the tower, are of the fused type, while service for all public spaces is controlled by QP breakers. There are dozens of the latter on the first floor and in the basement.

There are four 22½-kw electric range outlets, one for each kitchen. The 24 stores on the ground floor are supplied with services ranging from 30 to 200 amps.

No special voltages required

No special voltages were required—and, except for the power company's model vault, where 15 kv was brought in and stepped down to 120-208 volts, there isn't a transformer, even a dry type, in the whole building. Bus duct was used exclusively in the vault with not a wire in sight.

Despite the large space covered and the day-to-day nature of the "design" and layout, there are no long runs. The longest is that of the two 1,000-amp bus ducts to the top of the 14-story tower, 200 feet in all. Plenty of room was allowed for all panels and switch gear, which are fully accessible.

At the registration desk, a 42-circuit panel was installed to start with; then another 42-circuit unit was added, and finally a 20-circuit job was put in beside the others. Each time the conduit and feeds had to be changed to conform.

The way the job was "planned," there was little opportunity to keep the costs down, but, at that, the resourcefulness of the contractor and the labor speed-up permitted the hotel to open two months earlier than otherwise possible, and thus to cash in on the height of the rich winter season. If a large new hotel misses this nice starting dividend, it puts considerable strain on their finances.

The complete central air-conditioning system by Hill York provides two 400-hp compressors, and supplies piped chilled water with individual fans and thermostatic control in each room in summer, and hot water in winter. The electrical distribution is fed by two 2500-amp aluminum bus ducts.

All in all, the installation is considered to have supplied one of the best examples on recent record of the unnecessary difficulties and cost increases caused by inadequate pre-planning at the top on the part of the owners—but also an illustration of how experienced contractors and suppliers, men of good will, can surmount even these very formidable obstacles and put in an efficient, well-coordinated and easily-maintained system by bearing down and giving it everything they have!

Varied lighting effects

All of the 37 decorative lighting fixtures for the public areas were specially handcrafted in Havana by Lamparas Quesada Corp. They employed perma-brass finish on aluminum which will not pit, and some special fixtures were made of hand-chased cast brass. The factory also used collapsible chucks to fabricate as many different spinnings as required and supply exclusive designs.

Units included in the main lobby: one of ten feet in diameter with 24 arms and 25 lights, and one eight-foot fixture with 20 arms and 21 lights. Suspended from each polished-brass arm are translucent elongated plexiglass bells 20 inches long. Three "column" spirals with spun-glass bells adorn the lobby columns, and the stairwell is embellished by 14-inch-long concave bells of perforated spun brass. One of the most impressive units is that of the leaf design free-form flush-type ceilings fixtures in front of the elevators stations on each of the upper 13 floors. Each unit is 8x4 feet of hand-cut brass and holds eight lights. Perforated plates enhance the leaf effect.

The lower lobby has six fixtures seven feet in diameter with 28 arms featuring seven crystal balls and cups on each arm. In the cocktail lounge are four six-feet fixtures plus two wall brackets of cast polished brass with triplex crystal center columns and opal glass shades. The main dining room has

(Continued on page 127)

These air travelers at Love Field in Dallas, Texas, appear pleased with the recently-installed "gliding sidewalk" which has eliminated their weary trudge to and from planes through endless corridors.

Texas air terminal installs electrically-run sidewalk

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ THERE MOST CERTAINLY is something new under the sun!

That, at least, was the probable conviction of Texas electrical contractors in the Dallas area, recently awarded the novelty of installing and maintaining a "moving sidewalk" at the new $7-million Love Field municipal airport facilities.

No "tall tale" from Texas in *this* case, the "moving sidewalk" has been put there, it is said, to happify air travelers, tired of trudging through long airport corridors, by riding them to and from their planes.

Three moving units

Three "moving sidewalk" units, totaling 1,435 feet in length, carry passengers in both directions through three corridors or "fingers" leading out from the main terminal building to the airplane loading gates.

Operating speed has been set at 132 feet per minute, about half average walking speed and considerably faster than moving stairs. Passengers may walk while they ride, thereby increasing their rate of travel. When the public becomes accustomed to "moving sidewalks," consideration will be given to increasing their speed, it has been stated.

The Dallas "moving sidewalk" is the first to be used at an airport. It was designed and manufactured by Hewitt-Robins, Inc., Stamford, Conn. Called the "Glide-Ride," it has several unique features on which patents have been filed by Hewitt-Robins. One of these is an ability to go around corners and be formed in a loop, so that passengers are carried in two directions. The curving feature is not utilized at Dallas, but will be used elsewhere where the course is irregular rather than in a straight line as at Dallas.

(Continued on page 126)

The trio of passengers, above, stands on the moving sidewalk's 42-inch rubber carpet, which is wide enough for two to stand comfortably side-by-side. Corridors are completely air conditioned.

Contractor Gerson Maisel, Maisel Electric Co., of Washington, D. C., instructs a Saturday morning class of apprentice electricians.

Master Electrician Roy Sytes shows an apprentice how to adjust heater on motor controllers at a food refrigeration plant. Adequate on-the-job explanations are an important part of apprentice training.

Thorough attracts

By Gerson Maisel

Contractor
Maisel Electric Co.
Washington, D. C.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers

◆ THE TRAINING and recruiting of qualified personnel in the electrical trade has been a problem facing contractors for some time. While we are in need of young blood, the trade seems to lack attraction for the high school graduate. This situation needs correction. It even poses a serious problem with regard to future expansion.

Let me review the situation briefly. It seems that in order to enter the trade a high school graduate must put out a fee to become an apprentice. As an apprentice his wages in most cases are such that he could do better in other fields. Four years of apprenticeship must take place before qualifying for examination to become a journeyman. Often these examinations are difficult, failure follows and the result is discouragement and change to another field. Unfortunately we have lost another potential electrician.

Perhaps this step from apprentice to journeyman should be an automatic one after his four-year training period. Issuing him a journeyman's card perhaps should be a procedure at the discretion of the shop supervisor under whom he has trained.

A journeyman's card at this point may be a great stimulus to endeavor and self-improvement because the young mechanic will be working independently under his supervisor and his performance will be subject to District inspec-

apprentice training program top grade men to the trade

tion. He will learn more rapidly and get a feeling of his own progress.

At this stage of his advancement, it is conceivable to me that he would be willing to undertake a four-year period of study and training toward a master electrician's examination. An examination for master electrician's license is an essential for public protection and for the maintenance of high standards in the profession.

Training of the apprentice is a difficult proceeding under the best of conditions. The usual procedure is having an apprentice accompany a journeyman on the day's jobs. If a shop is lucky enough to have a journeyman electrician who is sincere, capable and conscientious, he is eager to get on from one job to the next. This attitude does not lend itself readily to training. He may use an apprentice to transfer tools and cable from the truck to the job, but generally he may regard the apprentice as a deterrent to the fast and efficient completion of his jobs. He may get a little impatient with having to furnish explanations as he works or having to stop to answer questions.

Disadvantage of old method

In his concentration on the job in hand, he often does not take into consideration the set of personality traits in the apprentice he is working with. He is not always cognizant of the apprentice who is taciturn and hesitant to ask questions, or may misinterpret the apprentice aggressively interested to learn why and wherefor everything is done.

The average journeyman has forgotten that someone once took the time and patience to teach him, that someone once took into consideration his personality and made adjustments in order to make a mechanic of him. The apprentice on the other hand often feels at the end of the four-year training period that he was nothing but a parts jockey, that he knows the electrical components necessary to carrying out a job but lacks the ability, the experience to proceed on his own.

He may feel very much dissatisfied because the four-year apprenticeship failed to accomplish for him all that he had anticipated. So again the electrical trade may lose good potential material.

We developed a program

We have tried to offset these discouraging losses by having a training program of our own. A school within our organization conducted by journeymen and by our master electrician on Saturday mornings from 8:30 to noon is compulsory for apprentices. They attend at their own expense, that is, we are not paying them for coming in to attend these Saturday class sessions. We do, however, pay the journeymen or master electrician at their usual rate for the three hours of instruction they give.

We serve coffee and buns right before the class opens but by 9 the deck is cleared for work. Conducted throughout the year, all aspects of electrical work are taught and demonstrated with student participation in discussion and activity under the eye of the master electrician.

There may be a session on heavy-ups. The instructor gathers bushings, ground clamps, service panels and all material necessary for carrying out a job. We have a plywood partition representing a wall. When the instructor has assembled all his needs, he goes over the whys of the code, discusses the location and application of all tools and equipment, and then proceeds to make his installation as he would on a job.

In these sessions we assume nothing in the student's background. We review elementary tools and their nomenclature, how one holds a hammer, screwdriver, wrench or drill; we go into the details of a panelboard, the method of screwing equipment to a board. When our instructor has completed his job, he invites one of the apprentices to disassemble his installation and go through the entire procedure of reassembling it with explanations as he works.

With experience we have learned this is a fine practice. As a mechanic talks and works, he gains confidence in himself. In articulating what he is doing and why, he gets thorough grounding in his job. It serves him in good stead when he later is in a customer's home and is questioned on a particular procedure. Each apprentice gets an opportunity to tear down a wiring job and reassemble it, talking aloud his explanation.

Another session may cover tying into circuits and extending circuits. Construction of the building is described, use and limitations of wire molds, running cable through existing conduits, cable concealed where fire breaks exist, etc. The instructor goes into stringing wires, drilling holes in the partition, discussing the Code as it affects the job, why the circuit is extended, using #14 wire for plugs, separate circuits for a motor, etc.

Eliminates future errors

Classes of this nature with close observation of how an apprentice proceeds saves many an error in the field.

We have full-morning sessions on the technique of tool handling in which we stress the importance of good clean and proper tools. At these sessions we watch them and correct their hold and manipulation of a tool, trying to improve their techniques in getting results.

Apprentices are encouraged to raise questions, request a repetition of some procedure, review what was not understood or where a point was missed. The jobs covered in their daily routine of the past week are recalled and apprentices are invited to inquire about any method they witnessed

(Continued on page 125)

Wholesalers review industry

◆ TODAY'S QUESTIONABLE economic picture and the exact position therein of the electrical manufacturer, wholesaler, and contractor was the topic vividly spotlighted at the Southeastern Electrical Wholesalers Association's eighth "Industry Day" meeting held in Atlanta recently.

Hinging on the specific theme, "Progress Today Requires Thinkability, Plan-ability, Believe-ability and Do-ability," this three-day meeting of the SEWA was reportedly its "bell-ringer," both in attendance and obvious enthusiasm generated among members and guests alike.

A seven-man guest speakers panel—representatives from both electrical manufacturers and regional distributors, plus an economist from the Federal Reserve System—appeared in agreement that, despite present evidence to the contrary, the general business outlook for the electrical industry, as a whole, looked bright. However, post-Sputnick pessimism must first be eradicated and greater selectivity of manpower achieved before material results could unfold, speakers generally agreed.

Following an invocation by SEWA Vice-President Ben Carson, of Kingsport, Tenn., President Cecil J. Matthews briefly welcomed members and guests. He emphasized that, as the American Indian forever reached out to his Great Spirit, today's man must likewise strive for more spiritual goals, as opposed to the strictly materialistic objectives. Man's future progress along would depend on effort expended in that direction, he said.

Presence in the audience of Dick McDonald of Miami, Fla., first president of SEWA, was acknowledged by President Matthews.

He then introduced F. R. Widmer of Cleveland, Ohio, assistant manager, Commercial Research Division of Republic Steel Corp., who spoke essentially as follows on the topic, "What Goes On Here?"

The economic picture

"The electrical industry has held a favored position in the economy. The long term growth trend is more sharply up than almost any other industry," reported Mr. Widmer.

"There is no reason to believe that this will change. The large utilities and electrical equipment companies have checked these trends as carefully as possible and without exception they are optimistic for the long term.

"In the short term, however, the picture becomes more complex and must be checked out in detail.

"Your market is derived from new construction, maintenance and repair, and renovation. Here I am not giving consideration to the fact that many electrical wholesalers also sell appliances and other related items. We will stick to the major area.

"Consider the over-all construction market in retrospect. The all-time record high came in 1955. Thereafter there were small declines in actual physical volume that were marked by increasing prices. In dollars, volume in '56 and '57 was higher.

"From the 1958 forecast level, we expect this year to be at least as good as '57. There will, however, be a shift in the component parts of the total. For example, we think this year marks the upturn of residential construction.

"From all available figures," continued Mr. Widmer, "the electrical wholesaler might very well conclude that he has very little to worry about. However, I am sure you realize that you just can't live through this general change in the business weather without having some of the rain fall on you.

Inventory psychology

"You can expect your industrial customers to react to the same inventory psychology that affects the general business community. They will use up every last unit in stock before reordering and expect you to have a replacement on their floor the same day.

"They will shop for price and service and compare quality to a degree unprecedented in recent years.

"They will schedule their construction jobs to eliminate overtime and reduce labor costs generally, forcing you to pay meticulous attention to *your* stock. The wholesaler that can deliver what the customer wants when he wants it will have a sharp competitive tool.

"You will find the customer willing to listen to sales suggestions that center on labor and cost savings generally. You will have more opportunities to do a constructive selling job than ever before.

"You can expect your manufacturing customers to whom you are selling components to start a program of product renovation with a review of every part to save cost.

"You can expect a wave of new products and upgraded old products from your suppliers. You must be sharp and buy sharp to keep up with your competition. Never, never take the attitude that because a product was good enough for daddy it's good enough for you. Expect and demand innovation.

"Things are not as bad by any means as they are being painted. Communications within industry today are fast. We read, make speeches and listen to them, call on customers and belong to professional organizations. Right now this network is being used to spread *fear*. This fear is *not justified*.

"The other morning," related Widmer, "I walked into the office of one of our product managers. His opening remark was typical, "Yesterday I made a call on the XYZ Container Company. The office of Bill Jones, the P. A., butts right up against the plant and usually it's so noisy from the press line on the other side of the wall that you can't hear yourself talk. Yesterday it was so quiet that you would have thought you were in a graveyard. Bill said they had only worked two days last week. They get an order in the morning, start up the line and ship by three o'clock to keep the order from going to a competitor. What goes on here?"

"Here was a company making drums that are sold to chemical producers. Chemicals are materials used to produce products which in turn are two or three stages re-

problems

moved from the final consumer.

"Way out there at the end of the line the final end items are still being sold but here at the drum plant the wave of inventory reduction has accumulated into a two-day-per-week operation.

"Neither our product manager or his P. A. friend had stopped to consider this compounding effect of an inventory reduction cycle. In their minds the whole economy had suddenly fallen apart. It dredged up out of their past, memories of the great depression of the thirties.

"You too will be hearing tales of woe like this one with greater frequency in the next month or so. But now that we are in the period between booms," Widmer concluded, "let's get ready for the next one!"

Personnel problems

President Matthews then introduced Larry P. Pleasants, of Salem, Mass., product sales manager, Lighting Division, Sylvania Electric Products, Inc.

"From any way you look at it, the outlook for the electrical industry is a bright one, indeed," said Mr. Pleasants. "It isn't hard to see that existing manpower is inadequate to cope with the tremendous expansion.

"In every industry it is constantly being heard, and our's is no exception, that there is a grave shortage of capable manpower to take over the ever-increasing number of business opportunities and responsibilities that are developing.

"In fact, two independent electrical distributors in this room have told me that they have deferred action on expansion programs simply because of the unfortunate absence of capable personnel to successfully carry out the expansion that they are aware is warranted by current business conditions and the obvious future opportunities.

"I repeat—these independent business managers deferred immediate action on an important growth project because they are unable to obtain sufficient qualified personnel in their own organizations or in the open manpower market today.

Retiring SEWA President Cecil J. Matthews, right, Matthews Electric Supply, Birmingham, passes the honorary gavel to President-Elect Leslie C. Crabtree, Union Supply Co., of Tallahassee, Fla., at the conclusion of SEWA's annual "Industry Day" meeting held in Atlanta.

Larry P. Pleasants, Sylvania Lighting Division, in an extensive flannel board presentation, defines qualities and attitudes to look for when recruiting today's sales personnel. He reported that some distributors had deferred expansion plans because of lack of trained personnel.

"These decisions, I'm afraid, are not too uncommon today in the independent distribution branch of the electrical industry.

"Sad as it is to face—this lack of qualified manpower is real. And, it is of such importance to the independent distributor that if it is not corrected by the common interest and cooperation of all of us in the years to come—others will find an answer and take our opportunity from us.

"If they do, I'm afraid most of us in this room won't like the changes that result. I fear a good many of us would no longer be factors in the distribution of electrical products, if in this phase of the industry at all.

"This is a rather strong statement, but I sincerely believe it could most certainly happen if we —you, the independent distributor and we, the independent manufacturer, don't recognize the mutual problems of our industry and the necessity of doing something about them together.

"Undoubtedly, this is being done successfully by some independent electrical distributors. But to be fully effective and retain the present independent channels of distribution, it must be a collective success of all of us. If such a collective success is not achieved—then, by the laws of sound business economics and human nature, other means will be found to distribute these products.

"Although I have said this certainly could happen—I frankly don't think it will, because I sincerely believe we aren't going to let it. We're going to start an extensive 'beefing up' of our recruitment and development program, so we'll be expanding in pace with the growth of our industry.

College recruiting

One of the most important tasks at hand is selling electrical distribution with the independent distributor as a career to the most outstanding young men from our colleges' and schools' annual graduating classes. We have to get the outstanding young college and school graduates to look upon electrical distribution as their field for the future.

"The competition for these graduates is tremendous. Most of the large manufacturers, including Sylvania, have teams of recruiters visiting colleges continually to interest graduates in their industry and companies. If you want to get the better than average of the college and school graduates, you are going to have to do a real selling job on the opportunities with your organization; and it must be remembered that we, the independent manufacturers, are dependent on your success in this program and our help can be expected.

The annual breakfast meeting with SEWA sponsored by the Southeastern Electrical Manufacturers Representatives Club has become an outstanding feature of each year's SEWA meeting. Those at the head table are, left to right: Past-President Cecil J. Matthews, Birmingham; Guest Speaker Leo Aikman, Atlanta Constitution; Executive Vice-Presi-

Internal prospects

Another means of providing potential executive and sales personnel for future expansion, is to take a long look internally. Possibly you have several boys who have been working their way up the ladder from a start in the shipping room or the billing department but are lacking in the formal business and technical background that is so necessary to advancement today.

"We should provide an incentive for such men to further their education while at the same time preparing themselves for greater responsibility and value to your organization in the future.

"Going hand in hand with more intensive recruitment should be more intensive sales training in an effort to keep pace with the electrical industry's expansion. Superior performance should be the goal of your manpower development and sales training program.

"For a moment, let's review why some men do an outstanding job and others just 'get by.' Let's consider what constitutes 'superior performance' and what we must do and what we need to know so we can help your personnel achieve their true potential.

"What, then, are the important factors in a person's make-up that add up to superior performance? I like to think the answer is: ability plus motivation equals superior performance, and job knowledge and skill make up ability, while basic desires and attitudes comprise motivation.

"The skill of using required knowledge of the job under varying sales conditions is of the utmost importance. It isn't enough just to have the required information. Superior performance demands being able to use that information with a high degree of skill without question, and that skill is acquired only through practice and coaching.

"We must likewise recognize that ability is not only experience, because experience can mean that a person has done things incorrectly so many times that he doesn't know how to change. It isn't simply an aggressive manner, a so-called sales personality, without any real knowledge and skill to back it up. Rather, ability is the result of blending the necessary information and the skill in using that information."

Mr. Pleasants concluded his remarks with some of the important aspects of the manpower development and sales training program conducted by Sylvania.

Reconvening Thursday after-

dent M. L. "Tiny" Tice, Atlanta; and SEMRC President H. A. "Sixty" Mason, Atlanta; Vice-President J. Ben Carson, Kingsport, Tenn.; Executive Director Art Hooper, National Association of Electrical Distributors, New York; Past-President Joe J. Perry, Sr., Atlanta; Past-President Dick McDonald, Miami; and President-Elect Leslie C. Crabtree.

noon, electrical wholesalers and their guests heard an address by Wiley W. Crowe, president of the Electric Supply Co., of Atlanta. During his slide-illustrated discussion of activities and methods in the sale and promotion of electric heating in high rate areas, Mr. Crowe stated:

"We began in earnest to perform the functions of an electrical wholesale distributor of electric heating in Georgia: to promote, stock, display and sell electric heating—to protect and be protected for our efforts.

"To do this, it was necessary first, to correct a mistake in the thinking of many customers that electric heating was too costly, and second, to insure economy of operation of electric heating.

"There was no question in our minds about initial cost. And we were sure that electric heating, if properly designed and installed, would satisfy the public's major question of heating electrically—*economical operation.*

"We instituted an electrical heating department in our business with a qualified specialist available to offer assistance and recommendations to contractors, architects, engineers and prospective customers. His consultative service was offered without charge or obligation. Naturally, this department made use of modern and approved methods of heat loss calculations, such as those published by the National Warm Air Heating and Air Conditioning Association."

Acknowledging full cooperation received from Georgia Power Company and nearby REA cooperatives in promotional work and co-ordination of activities with this supplier, Mr. Crowe went on to explain the essential individual educational program involved.

"We prepare heat loss data sheets on a standard form, listing customer's name, address, type of construction, insulation, glass exposure, etc.

"On the reverse side of the form, we list room or area heat loss, installed and required wattage, cost of heating equipment and operational cost of heating per season.

"With this form we have a picture of the job. When we show this picture to the prospective customer, we have an opportunity to

Southeastern Electrical Wholesalers Association officers and members of its board of governors for 1958 met in executive session on the association's initial day of proceedings. Seated around the table are, clockwise, J. M. Passailaigue, P. & W. Electric Supply Corp., Columbus, Ga.; R. W. Brantley, Jr., Central Electric Supply Co., Hickory, N. C.; Joe H. McMullan, Mack Electric Supply Co., Dothan, Ala.; President Leslie C. Crabtree, Union Supply Co., Tallahassee, Fla.; Vice-President J. Ben Carson, Kingsport Electric Co., Kingsport, Tenn.; Past-President Cecil J. Matthews, Matthews Electric Supply, Birmingham; Alvin H. Phillips, Sullivan Hardware Co., Greenville, S. C.; Milton O. Hollis, Raybro Electric Supply, Inc., Tampa, Fla.; Treasurer Fred H. Dendy, Sr., Electrical Wholesalers, Atlanta, Ga.; and Joe J. Perry, Sr., The Electric Supply Co., Atlanta.

dispel many of the misconceptions of electric heating."

Mr. Crowe detailed his company's method of employing gimmicks for illustrating to customers the value of insulation, and mentioned aspects in their mass educational program. He concluded with impressive figures reflecting an optimistic outlook for electric space heating in the South.

Meeting growing demands

G. Dewey Hynes, vice-president, General Cable Corp., of New York City, discussed the challenge to distribution brought about by increased capacity and growing future demand. Said Hynes:

"American industry performed production miracles in assisting in our recent war efforts, and as a result, our productive capacity has greatly expanded. To say that our capacity to produce is too great, when so many of our people still lack many of the ordinary comforts of life, is not in keeping with our American traditions.

"The finest product or service is useless until it is in the hands of the consumer. Inventories do not represent a profit, only an investment, and production and operating savings are not realized until the product and service has been sold.

"In our highly competitive dynamic economy, the future of our business, just as the future of our economy, depends on more and more sales, better distribution, and sound marketing methods.

"Dynamic marketing, through widespread dissemination of facts about products and services, through the kind of communications which result in customer sales, must be continuously developed.

"Undoubtedly, basic research, an improving technology, effective management in an environment of free enterprise, have all been instrumental in raising our standard of living over the past decades. The importance of these factors would not be denied, but they must be joined with an effective distribution system, for without it, they are powerless to meet consumers' needs and wants.

Distribution's role

"The role of distribution in our economy of abundance, has not been sufficiently recognized because of a lack of appreciation of the role distribution actually plays. Economists have long recognized production, as the creation of utilities to satisfy human wants. If distribution is recognized, as it should be, as an integral part of the production process, there would be no doubt of its productivity in an economic sense.

"From another direction, the significant role of distribution, has not been sufficiently recognized. If production is to be guided wisely, the market must be intelligently interpreted. Questions arise, both on the qualitative and quantitative side. This has been aptly called market analysis for product control.

"In emphasizing the importance of distribution, to the success of business enterprise, we must not overlook the importance of profit to the economic health of business.

"A fair margin of profit is important to every segment of our economy. When the consumer buys at a price that does not provide a fair profit to both the manufacturer, and the distributor, he may be making a short-term gain and a long-range loss. Good wages, funds for new plants and equipment come from earnings after taxes. These retained earnings, plus depreciation reserves, have been the source of a large percentage of the capital which has financed the great business expansion.

"A sound pricing policy should give weight to the real use value of a company's products. The prices should reflect qualities that give the user greater convenience, service, reliability and the like; they should thus embrace a dynamic, comprehensive concept of competition and not merely a sterile, antiquated 'price only' competition.

Creative price policy

"A consistent, creative price policy, firmly rooted in long-term growth will better service the public. Such sound and broad creative pricing policies will ensure, that buyers will not pay too much in times of scarcity, nor will industry be paid so little in times of over-supply that it will be unable to continue to break new technological frontiers and achieve fundamental gains in product values, thereby providing for the American people, an ever-increasing standard of living.

"To sum up the functions of modern creative pricing, then, we can conclude that while price will always be a stimulant to consumption, and must remain obedient to laws of supply and demand, it must also do so at levels that support other vital needs in a company's planning or an industry's development. And chief of these needs is the stimulus of progress and growth. . .

"I think we are forced to conclude that distribution is the key to our economic progress in the future.

"What is the pattern for developing this important facet of our economy?

"I believe it can be summed up in one word—cooperation.

"The manufacturer must continuously try to understand the problems of the distributor, and you must be sympathetic to the objectives of the manufacturer. If we consider ourselves on the same team, with the best interest of manufacturer, distributor, and consumer always in mind, satisfactory results will be forthcoming. . .

"Despite the amazing performance of our industry in the past," concluded Mr. Hynes, "and despite even more enormous possible growth projected for the future, we cannot assume that this growth will automatically happen. It must be made to happen. And there is no better way than by working together, with mutual confidence, to find ever-better methods of distribution.

Conduit consignment

Speaking on the subject "A New Dimension in a Phase of the Electric Distribution Industry," Carl S. Menger, vice-president of Triangle Conduit and Cable Co., New Brunswick, N. J., discussed the pros and cons of consignment selling of electrical conduit.

"The manufacturer and the distributor are wedded to each other, and the tie is indeed a binding one," Mr. Menger asserted. He then went on to emphasize that consignment and outright purchase of products were two methods being heatedly debated today.

"Consignment of staple products weakens the distributor's role in this economic scheme of things," he said. "Actually, my company feels that it improved the distributor's role by ending consignment practice. The distributor, after all, is in business to provide service. And if he does a sincere job at providing service, he must invest in his own business and develop a necessary feeling of responsibility—thus eliminating the fly-by-night, price-cutting direct agents who are forever plaguing his relationship with contractors."

(Continued on page 124)

"EMT installation is easy when we use SPANGLEAM"

says Al Wendt, Contracting Manager, Cannon & Wendt Electric Co., Phoenix, Arizona

Cannon & Wendt, electrical contractors for the Camelback Town & Country Shopping Center near Phoenix, Arizona, buy large quantities of SPANGLEAM EMT and SPANG Conduit annually. Why do they choose SPANG? Contracting Manager Al Wendt, explains some of the reasons.

"All SPANGLEAM EMT used on the Camelback job was clean and strong. It's dependable and tough and has good corrosion resistance. When inspecting the conduit before pulling wire, we found no burrs or snags. SPANGLEAM bends easily without kinking. We never worry about conduit failure when we use SPANG."

Electrical contractors know they can rely on top-quality performance every time with SPANGLEAM EMT. You get this job-tested quality when you use any SPANG electrical product. It's *quality-controlled* throughout manufacturing, uniform and easy to work with on any kind of job. Ask for SPANG and your nearby distributor will deliver your order in a hurry.

Wiring the shops at the expense of the tenants makes dependable wiring a must. Easy-bending SPANGLEAM EMT helps insure trouble-free wiring and electrical service, reports Mr. Wendt of Cannon & Wendt.

Designer: John Davis & George Sparling, Phoenix, Arizona
Architect: Sholer, Sakellar & Fuller, Phoenix, Arizona
Developer and Owner: Jere Strezek
Electric Contractor: Cannon & Wendt Electric Co.
Project Engineer for Cannon & Wendt Electric Co.: John Lathen
Electrical Engineers: Barney Hartley & Ernest E. Cannon
Spang Distributor: Brown Wholesale Electric Co., Phoenix, Arizona

SPANG CONDUIT

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Division of The National Supply Company
GENERAL SALES OFFICE
TWO GATEWAY CENTER PITTSBURGH PA.
District Offices and Sales Representatives in Principal Cities

Three-million-dollar, 80-shop Camelback Shopping Center uses 2000 feet of EMT in each store. Wiring serves lights, air conditioning, wall outlets and other electrical equipment.

Basic motor control circuits

By M. R. Brice

Manager, Service Sales Div.
Cutler-Hammer, Inc.
Milwaukee, Wis.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ TO DESCRIBE various fundamental motor control schemes, elementary diagrams, sometimes called schematic diagrams or line diagrams, will be used, so it might be well to review the mechanics of the elementary diagram and see how it is different from the ordinary wiring diagrams which are perhaps more familiar.

Elementary diagrams

To illustrate, let us consider a primary resistor type roving frame starter, used to provide a smooth, low torque start, to reduce broken ends. The control panel contains a starting resistor, a main contactor, a timing relay, an accelerating contactor, a thermal overload relay and necessary interconnecting wiring.

Fig. 1, is the wiring diagram of this starter and its pushbutton station. Notice that the diagram symbols are simplified pictures of the devices with their terminals, each in its correct geographical location just as it appears on the control panel. The power wires are represented by heavy lines, the control wires by light lines, and the outlines of the control panel and pushbutton station by broken lines. This type of diagram makes it easy to install and wire the controller, because the electrician can readily find each terminal to which he makes a connection.

This particular controller is not very complicated, so it is possible, with a little study, to figure out from the wiring diagram exactly how the controller works. However, using the elementary diagram Fig. 2, we can see at a glance exactly how the starter operates.

In an elementary diagram we get rid of the geographical limitations of showing the actual physical location of parts on the panel. Instead, we arrange our parts on the elementary diagram based on functions. We even separate the individual contacts and coils of a single contactor or relay to show the control scheme more clearly.

You will notice that all of the power wiring is at the top and all of the control wiring is at the bottom of our elementary diagram. Pushing the "Start" button energizes the coil of the contactor "M", causing the "M" contacts to close, putting power on the motor through the resistors "R1-R2," "R11-R12" and "R21-R22."

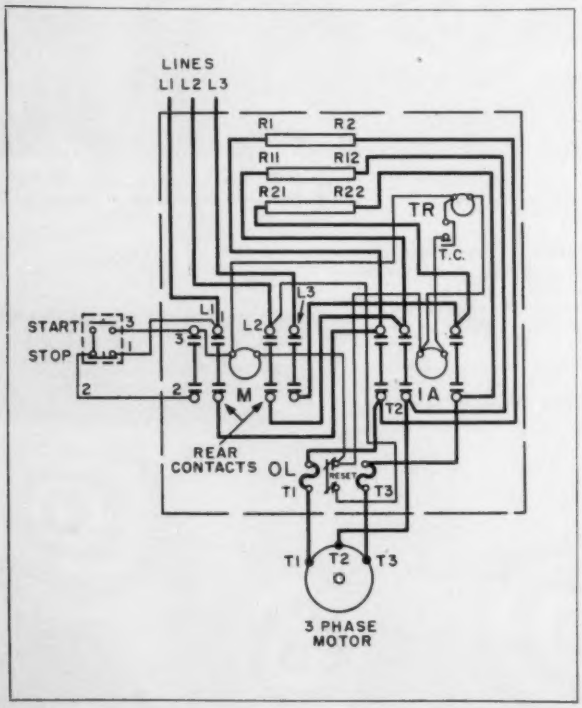

Fig. 1 - Rover frame smooth starter wiring diagram.

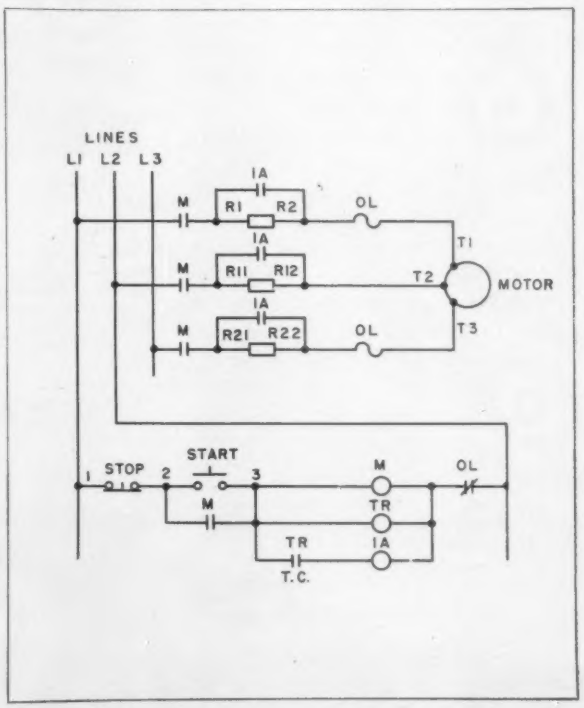

Fig. 2 - Elementary diagram for starter of Fig. 1.

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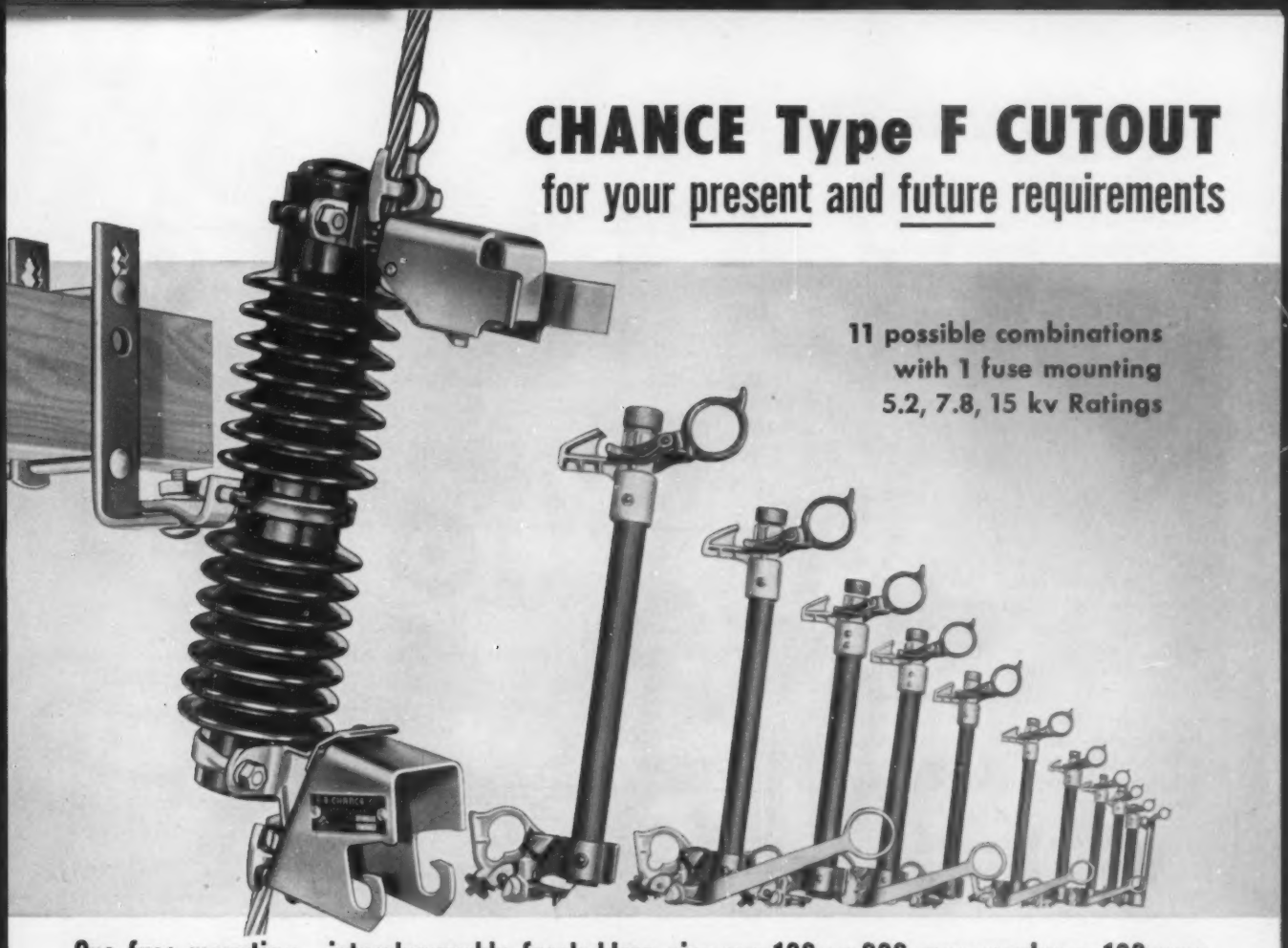

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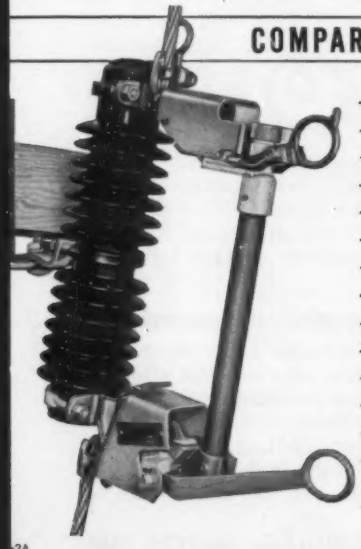

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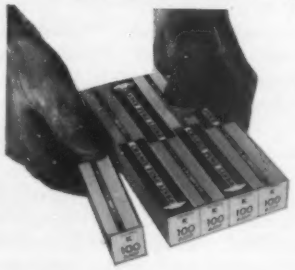

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The normally open electrical interlock on contactor "M" also closes, so that "M" stays in when the "Start" button is released. The coil of the timing relay "TR" is in parallel with the "M" coil so it also is energized. At the end of the timing cycle of three or four seconds, the timed closing contact of "TR" closes to make circuit to the coil of contactor "1A," whose contacts then by-pass the resistors to let the motor run at full voltage.

The heater coils of the overload relay "OL" are shown in the motor circuit. The normally closed "OL" control contact is in series with the contactor coils, so that tripping of the overload relay will stop the motor. Pressing the "Stop" button, or a power failure, also will cause contactor "M" to open. Since the "M" interlock also opens, the motor will not restart until we again press the "Start" button.

Now let us look at some of the basic motor control circuits, using elementary diagrams. In each case, for the sake of simplicity, we will omit the power circuits from our illustrations and show the control circuits only.

Three wire control

We will look first (Fig. 3) at the most basic circuit of electric motor control—the three wire control circuit, providing undervoltage protection.

Undervoltage protection is the effect of a device which causes and maintains an interruption in the power supply to the main circuit when there is a reduction or failure in the main power supply. On most machines it is an important safety feature, protecting the operator from injury and the machine from damage due to an unexpected restart after a power failure. Here is how it works.

When the "Start" pushbutton is pressed, a circuit is completed to energize the coil of the main contactor "M," and the contactor closes to apply power to the motor. An electrical interlock on "M" also closes, completing a circuit from 2 to 3 around the "Start" pushbutton. The pushbutton is of the momentary contact type, so as soon as the "Start" button is released its contacts open, but the contactor coil is still energized through the electrical interlock and the motor continues to run.

If the line voltage should drop to a low value, or fail completely, or if the "Stop" button is depressed, the magnetic contactor "M" will open, disconnecting the motor from the line. The "M" electrical interlock also will open, so the contactor cannot re-close until the "Start" button is pressed. Thus the motor will not restart unexpectedly when power service is restored.

This is known as "three wire control" because three wires are used to connect the pushbuttons to the starter. Most of the general purpose magnetic starters are used this way.

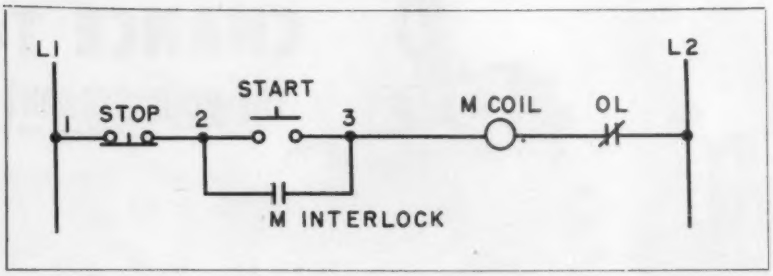


Fig: 3 - Three-wire control providing undervoltage protection.

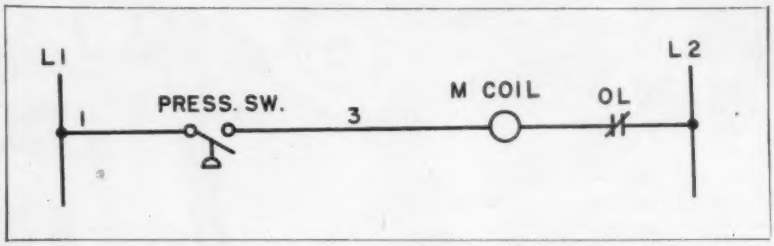


Fig. 4 - Two-wire control providing undervoltage release.

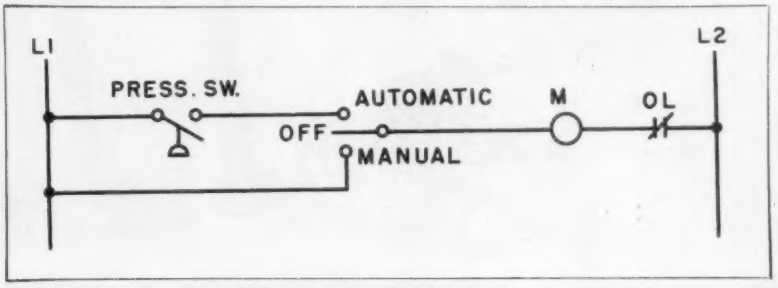


Fig. 5 - Three-position pilot switch control.

Two wire control

In some few cases, undervoltage protection is both unnecessary and undesirable. We should not have to push buttons for air conditioners, ventilating fans, water pumps and such like to restart them after a power failure. Controllers for such applications are used with a two wire, maintained contact pushbutton station or a thermostat or a pressure switch or the like, to provide undervoltage release.

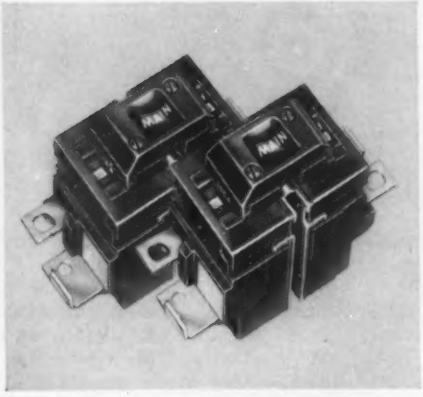
Undervoltage release is the effect of a device which causes an interruption in the power supply to the main circuits when there is a reduction or failure in the voltage supply, but which *does not* prevent the re-establishment of the power supply when the voltage supply reappears.

Our diagram sketch (Fig. 4) shows how it works. Closing the pilot device contacts across 1 and 3 energizes the "M" contactor coil to close the contactor and start the motor. The pilot device contacts stay closed, so no electrical interlock is needed. If the line voltage should fail, the contactor "M" will open, but when voltage returns "M" will reclose because the control circuit is still closed through the maintained contact pilot device.

3-position pilot control

When a motor is normally controlled from an automatic pilot device such a pressure switch, sometimes it is desirable to provide means for starting or stopping independently under manual control. This can be done with a

Pushmatic*—magic button to extra sales!



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Houston, Texas

Standard Electric Mfg. Co.
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 8, Sta. D
Atlanta, Georgia

maintained contact three position pilot switch connected as shown in Fig. 5.

With the switch turned to "Automatic," the pressure switch controls the motor. With the switch at "Off" the motor cannot be started, and in the "Run" position the "M" coil is energized whether the pressure switch contact is open or closed.

Multiple station control

Sometimes we want to start and stop a motor from two or more different locations, such as the two ends of a spinning frame. This is easy to do with a three wire control circuit (Fig. 6). Simply connect all of the start buttons in parallel and all of the stop buttons in series.

Pressing any one of the start buttons will energize the "M" coil and the "M" interlock will maintain the circuit. Pressing any stop button will break the circuit to "M" and stop the motor.

Reversing control

A reversing controller, as shown in Fig. 7, has two contactors, one for each direction. These contactors are mechanically and electrically interlocked to be sure that they connot create a short circuit by both being closed at the same time. When the "Forward" button is pressed, the "F" contactor is energized through the normally closed contacts of the "stop" button, through a normally closed interlock on the "R" contactor and through the normally closed contact of the forward limit switch, if one is used.

The circuit is then maintained through the normally open "F" interlock. The normally closed "F" interlock in series with the "R" contactor coil opens, so that contactor "R" cannot operate. If limit switches are used, when the machine reaches the end of its forward travel the forward limit switch "FLS" opens, dropping out "F" and stopping the motor. The motor cannot be restarted in the forward direction while "FLS" is held open.

However, pressing the "Reverse" button will pick up the "R" contactor and reverse the motor. If we should press the "Reverse" button while the motor is running forward, nothing would happen because the normally closed "F" interlock would be open, preventing a circuit to the "R" contactor coil. We would have to press the "Stop" button to drop out "F" and then we could pick up "R." This connection often is desired to prevent accidental plugging of the motor.

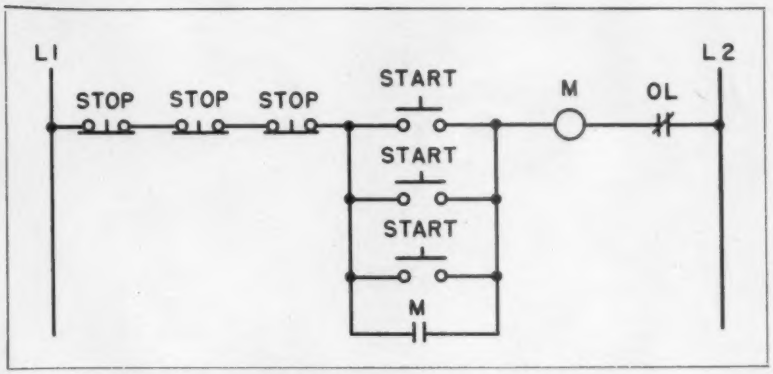

Fig. 6. - Diagram showing multiple station control.

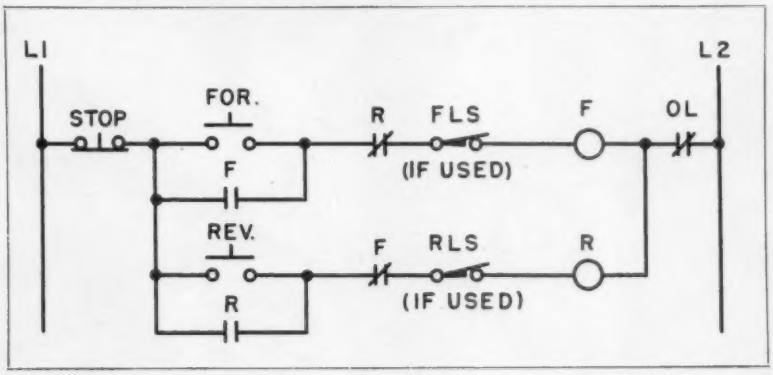

Fig. 7 - Reversing control with interlock contacts.

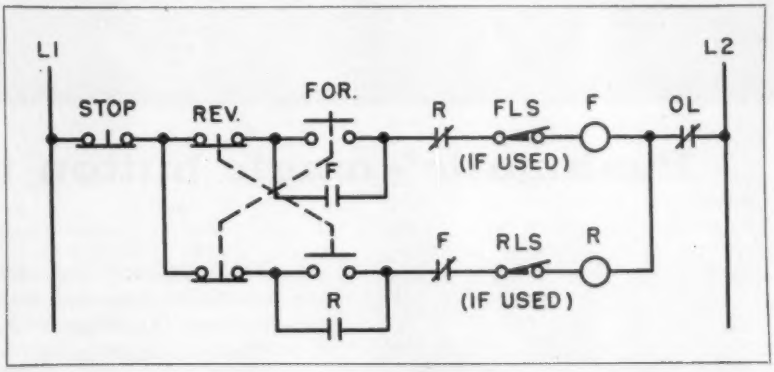

Fig. 8 - Reversing control with non-stop transfer.

Another connection (Fig. 8) can be used, however, to transfer between forward and reverse without pressing the stop button. We simply add a normally closed contact to the "Forward" button and one to the "Reverse" button, connected as shown. The dotted line on the diagram indicates that the two contacts are operated by one button.

Now, if we are running in the forward position pressing the "Reverse" button drops out the "F" contactor, closing the "F" normally closed interlock and picking up the "R" contactor. This connection is used where it is permissible to plug the motor, that is, reverse it without stopping, and where easy, fast reversal is required.

(This discussion of basic motor control circuits will be continued in the next issue of Electrical South.)

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New air conditioning system operates via sub-floor ducts

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ LITTLE MORE THAN 25 years ago, introduction of Q-Floor by the H. H. Robertson Company of Pittsburgh, Pa., completely revolutionized the fields of sub-floor construction and electrical wiring of modern buildings.

Placed on the structural frame of a building and given a concrete fill to provide a level surface, this cellular steel floor was found to combine qualities of light weight and great strength, a distinct improvement over slower, conventional types of sub-floor construction. Furthermore, it was discovered that the cellular structure of the floor units advantageously lent itself as raceway for electrical wiring, permitting floors literally to be tapped at any desired location for both power and telephone outlets.

Thus, estimates today have pegged use of Q-Floor in more than 12,000 buildings, outstanding among which are Chicago's Prudential Building, New York City's Lever House, Pittsburgh's Alcoa and U. S. Steel-Mellon Bank Buildings, and Dearborn's Ford Motor Co. Building.

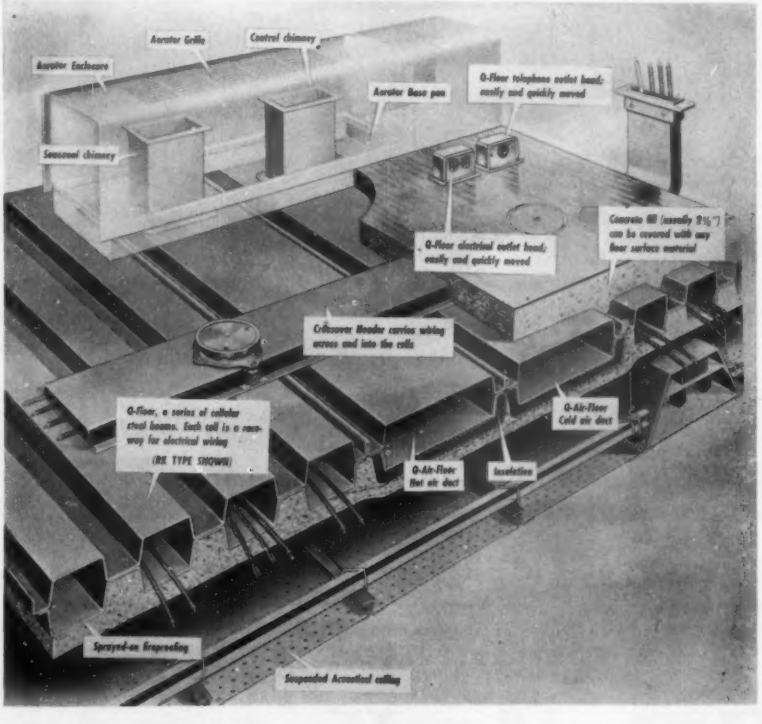
Unique combination

Robertson has now wedded the "quick-in" and "quick-change" structural and electrical features of its Q-Floor to a dual-duct high velocity air conditioning and heating distribution system—known as *Q-Air-Floor*—said to save up to five per cent of total costs of a building.

Q-Air-Floor, the company claims, can reduce any ceiling-to-floor dimension from eight to 16

(Continued on page 122)

The trim Q-Air-Floor aerator units, hardly larger than the baseboard itself, provides year-'round air conditioning and heating comfort, enabling building owner to take full advantage of maximum rentable area.


Aerator Grille
Control chimney
Aerator Enclosure
Aerator Base pan
Q-Floor telephone outlet head; easily and quickly moved
Seacoast chimney
Q-Floor electrical outlet head; easily and quickly moved
Crossover Header carries wiring across and into the cells
Q-Floor, a series of cellular steel beams. Each cell is a raceway for electrical wiring
(RX TYPE SHOWN)
Q-Air-Floor Cold air duct
Q-Air-Floor Hot air duct
Insulation
Sprayed-on fireproofing
Suspended Acoustical ceiling

Cut-away sketch, above, shows relation of Q-Air cells to complete Q-Floor construction, a new concept which buries both electrical and air conditioning distribution system in the floor.

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Ralph Anderson of Venice, Florida, does a $100,000 business yearly, which is predominantly housewiring. He estimates on an outlet basis.

The "educated guess" --method of estimating

By Harry J. Miller

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ "SINCE it is a rarity for us to get a good set of specifications for jobs in our area, particularly for homes built hereabouts on which we are asked to estimate, we find it most practical to get the house plan and mark in the outlets ourselves, according to the owner's or builder's idea of what he wants in an electrical installation.

"While this means we almost have to draw the entire electrical plan, overlaying the original house plan with our symbols, it's the only safe way to lay the foundation for an educated guess when making up our bid."

So says Ralph Anderson, owner of Anderson Electric Service, in Venice, Florida, who does around $100,000 yearly in wiring, employs nine men, and has just finished the wiring of the new Venice Hospital addition at a cost of about $25,000.

Since Anderson goes in for housewiring as well as commercial work, with the former predominating, he reports that the best way to estimate on a house is on the outlet basis, using an item-for-item take-off of all required materials, although never figuring less than $4 an outlet in this area.

"We begin our figuring with outer walls, considering if they're to be block-unfurred, since this means a trip back to cut boxes and inserting them. Thus we charge $1.25 more per such outlet than for those installed on an inner wall frame.

"For single-pole switches, ceiling outlets and duplex receptacles in frame construction, we usually set a figure of $4.50, while three-way and four-way switching brings $6 an outlet.

"How this figures out for us is indicated by our charges. For example, on ceiling outlets, we list:

One bar hanger	$ .20
One four-inch box	.25
20 feet #14/2 cable plus ground	.70
Staples	.10
30 minutes labor	1.50
Total cost	$2.75

"Since our estimating figure is $4.50, we have a margin of $1.75.

"A kitchen receptacle box figures out about the same as a single pole switch:

Receptacle box	$ .24
Device (receptacle)	.24
One plate	.09
20 feet #12/2 cable plus ground	.90
30 minutes labor	1.50
Total cost	$2.97

"On items such as a range, dishwasher, clothes dryer and other special-purpose outlets, we figure on a footage basis. On a standard three-wire residential installation our figures are $.70 per foot, and this includes installation and a range receptacle at the end of the run.

"For a built-in range top, we get $.55 per foot. Our estimate is $.70 per foot for a standard range. This is broken down to $.35 per foot for cable, $1.45 for the receptacle, and $.35 per foot for labor, totaling $2.15.

"With an average run of twenty feet, the total cost is $10.45 with $7 for cable, $2 for labor and $1.45 for the receptacle.

"Our estimate figure would then be $.70 times 20 feet or $14.00, subtracting $10.45 leaves a comfortable margin of $3.55.

"On an oven and dryer, we use a figure of $.50 per foot, along with figuring on one to twelve circuits and a 100 ampere main service at $90.00, in which would be included about five feet of 1¼-inch conduit containing two #2 type TW and one #4 solid bare neutral.

"But estimating on industrial and commercial work is a lot different than housewiring jobs. We consider it unsafe to estimate commercial installations without a complete and comprehensive set of specifications. Here, it is mighty important that the electrical contractor know exactly the calibre of the people doing the job he's bidding on. He needs to know what facilities will be required on a large job, and whether he has them. If he hasn't, then he must figure on the cost of hiring them.

"For example, we had bid on laying a lengthy run of underground cable on one job. The cable came wound on a large reel, and

(Continued on page 127)

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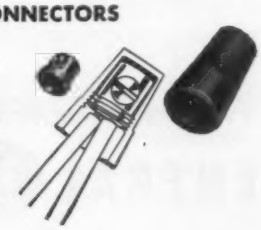

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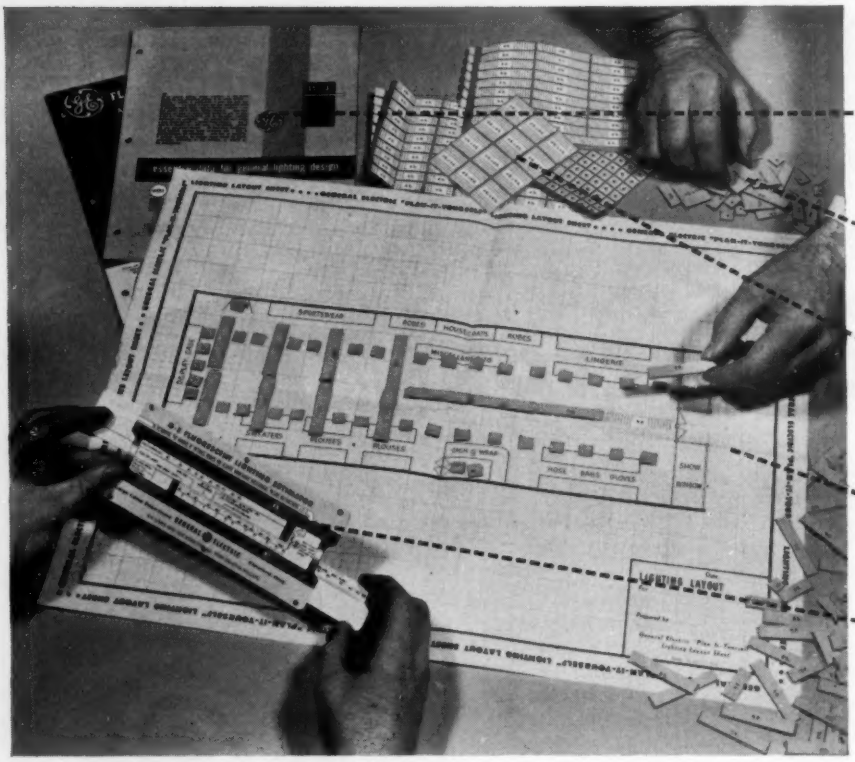

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- **A. L., Electric Service Co. Representative from Pittsfield, Mass.**—"We use parts of the kit on every job we lay out—75 of 'em to date!"
- **H. B. S., Manufacturer's Representative from Dallas, Texas**—"We've used the General Electric Lighting Layout Kit on 28 jobs. It's quick, easy and complete!"
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(names furnished on request)

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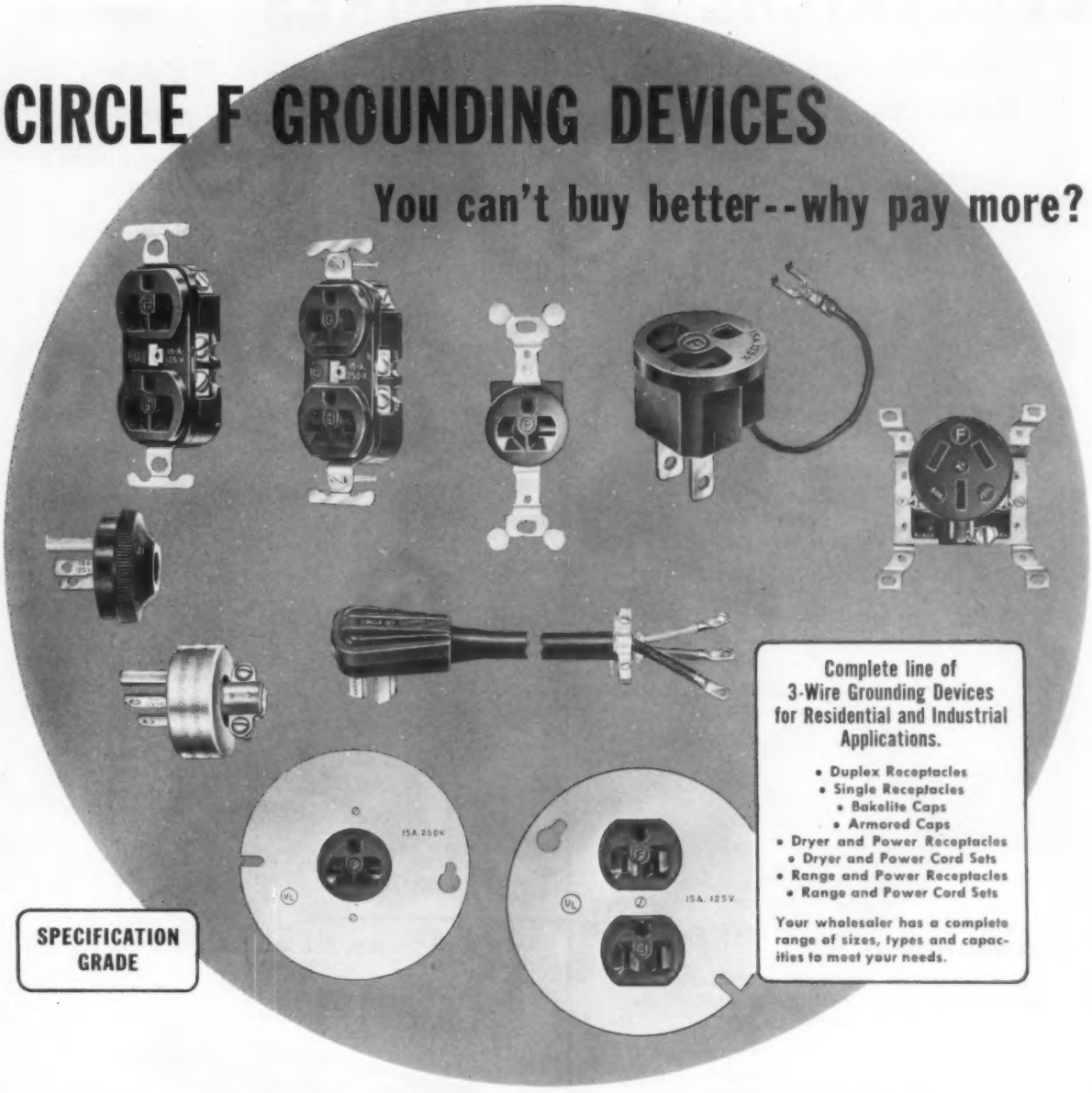

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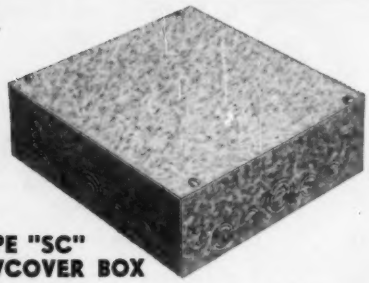

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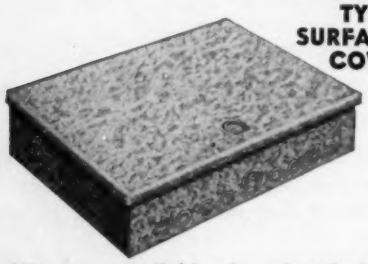

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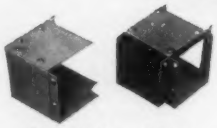

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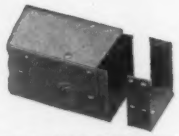

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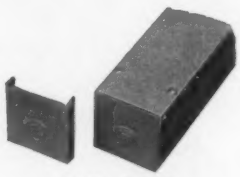

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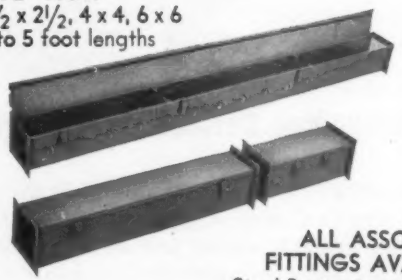

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FINISH: A triple-layer treatment that exceeds Federal and U.L. specs for longer-lasting protection.

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Hole Depth Increases With Size of Conductor ... thereby providing more contact area for the conductors being connected.

COLOR CODE	WIRE SIZE ACSR	WIRE SIZE AWG	HOLE DEPTH IN INCHES
Brown	–	8 sol — 10 str	.820
Green	–	6 sol — 8 str	.840
Blue	6	4 sol — 6 str	.860
Orange	4	2 sol — 4 str	.925
Red	2	1 sol — 2 str	1.010
Yellow	1/o	1/o str	1.185

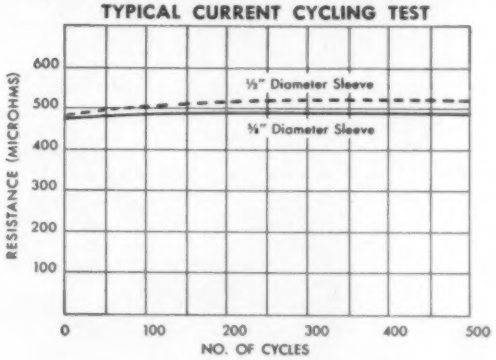
The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

FIRST! Printed (not indented) permanent COLOR CODING *is easier to read*—makes size identification positive and quick.

FIRST! Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture ... and, if a particle of the seal is pushed into the chamber, it is conductive.

FIRST! Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount.* Won't squirt out on glove or in face.

Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.



A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

Test Conditions

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

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Higher Voltage Distribution Reduces Costs

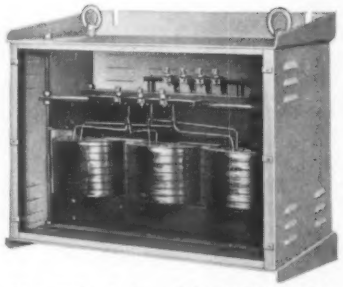
This is best accomplished in new buildings and modernization projects, by installing SORGEL dry-type transformers at load centers, using higher voltage feeders.

ALL Sorgel dry-type transformers are so quiet that they can be installed in any convenient place, thus assuring the most efficient distribution, best voltage regulation, and lowest wiring cost — in institutional, commercial and industrial buildings.

COST LESS TO INSTALL, because they are all self-contained in a single unit — either single phase or 3-phase — equipped with substantial wall brackets or floor mounting base. No separate brackets to make or buy. Easily accessible, roomy connection compartment, with wide choice of knockouts. Solderless terminals.

LIBERAL DESIGN, HIGH EFFICIENCY. SORGEL dry-type transformers are guaranteed to carry their full rated load continuously at high efficiency. They are so liberally designed that they can carry an overload during an emergency at a safe operating temperature. Vacuum impregnated windings brazed to solderless terminals assure years of trouble-free service.

Available in all standard and intermediate ratings and voltages, ¼ to 3000 Kva, and from 120 volts to 15,000 volts.



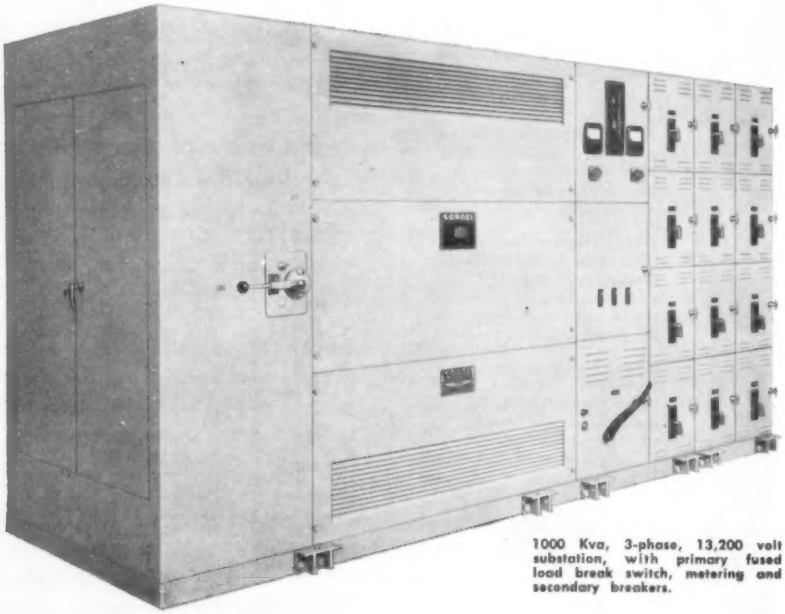
15 to 50 Kva 3-phase, 480 to 208Y/120 volts. Wall mounting transformer. Connection compartment panel removed.

Substation transformers

The same quiet Sorgel transformers, in ALL ratings up to 3000 Kva and up to 15,000 volts, are also incorporated in substations. Procurable with any type or make of switchgear, or from any substation manufacturer.

Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.



1000 Kva, 3-phase, 13,200 volt substation, with primary fused load break switch, metering and secondary breakers.

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SORGEL ELECTRIC CO., 835 West National Avenue, Milwaukee 4, Wisconsin

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the modern twist in guying

The picture comparison makes GUY-GRIP dead-end benefits obvious:

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slim, modern GUY-GRIP dead-ends, free from bolts, give your guying jobs a finished, craftsmanlike appearance.

2. YOU SAVE *HOURS* OF COSTLY TIME...
takes only a minute to install a GUY-GRIP dead-end — about the same time spent in securing one nut and bolt.

3. YOU ELIMINATE ALL TOOLS...
wrenches, pliers, and other tools are completely unnecessary in applying GUY-GRIP dead-ends. The operation is done entirely by hand.

4. ASSURES POSITIVE GRIP...
under all field conditions, whether the guy is relaxed or under tension. Once the legs of the GUY-GRIP dead-end are entirely applied to the strand, you *know* the assembly is complete and permanent.

5. RESISTS STRAINS AND WEATHER...
GUY-GRIP dead-ends can take an unbelievable beating. Tension, impact, temperature extremes . . . whatever force is exerted against GUY-GRIP dead-ends, they withstand the most extreme conditions, never relinquishing a single ounce of their gripping power.

These are only a few of the many reasons why you might want to try the modern twist in guying. Write for more information: Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland.

PLP 10 YEARS OF Power Line Progress

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TYPE MF-SE (1949)

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30 AMP.

50 AMP.

TYPE MK

The Duncan Type MK Class 200 meter is the latest of the improved singlephase MK line, built to accurately meter a wide range of loads from a few watts to the meter's full 200 ampere capacity. Arc-resistant insulation in the electromagnet, self-contained arc gaps to by-pass electrical disturbances, and Alnico V permanent magnets to maintain calibration stability are just a few of the MK features in this meter.

This meter also offers excellent performance. Note the "straight line" load curves in diagram below. Meters are available with test ampere ratings of both 30 and 50 amperes, starting watts 24 and 36, respectively.

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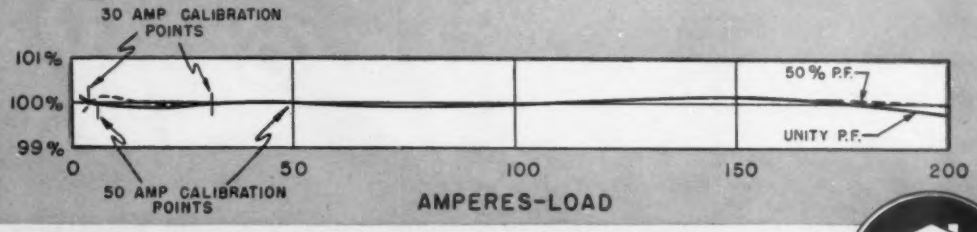

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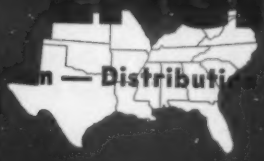
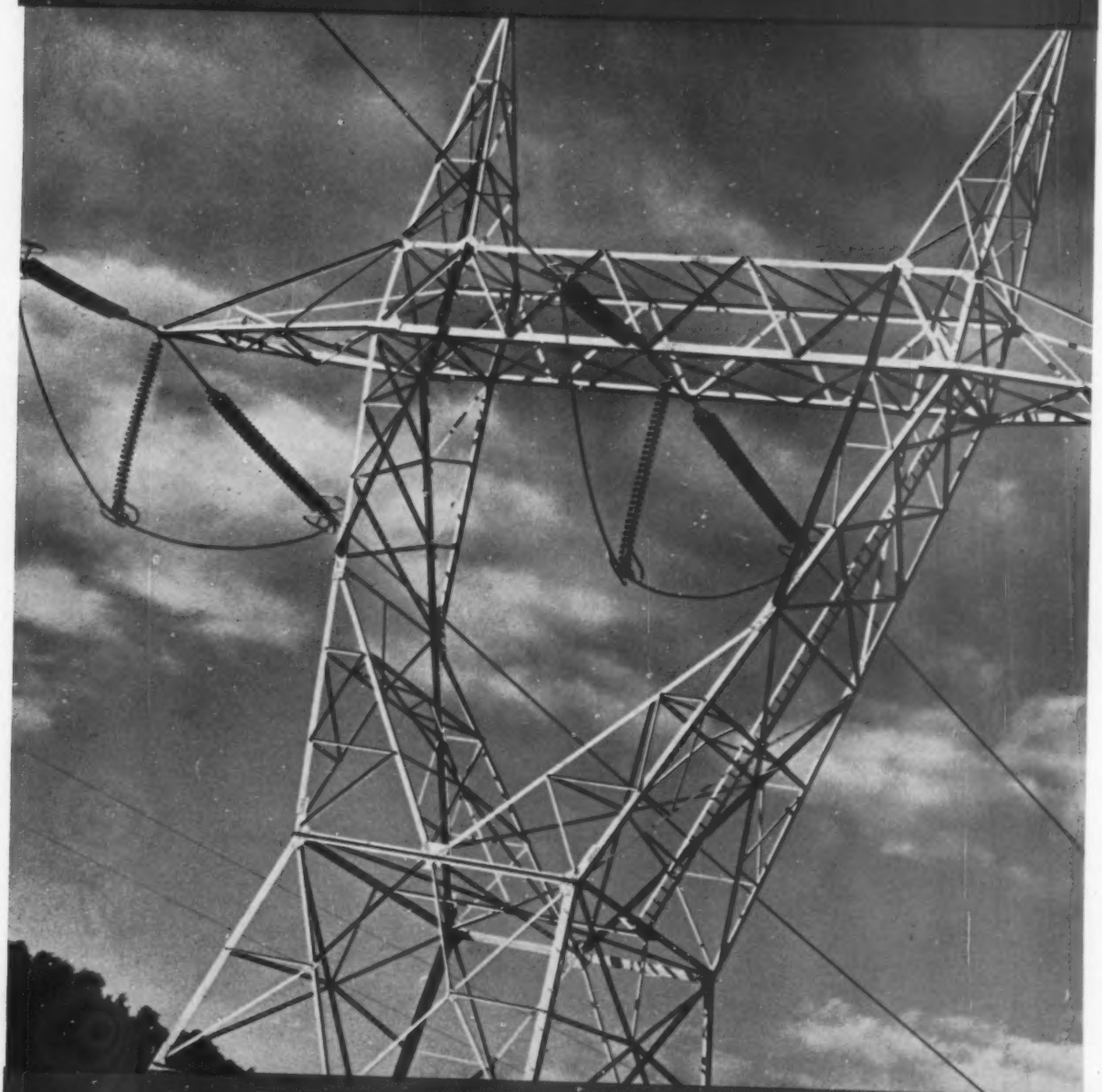


Transmission — Distribution — Metering

Design
Substations

Testing
Maintenance



» Substation practices studied at AIEE Winter Meeting—Pg. 56
» Transmission and distribution system protection plans—Pg. 42

Substation practices studied at AIEE Winter Meeting

◆ UTILITY ENGINEERS, whatever their specialties, found a wealth of practical material in the 112 technical sessions of the Annual Winter Meeting of the American Institute of Electrical Engineers, held in New York City in February. Of particular interest to utility company engineers was the considerable discussion presented on substations.

Other subjects that received comprehensive treatment included transmission and distribution economics, reclosing circuit breakers and other phases of switchgear design and application, relaying, metering, and special studies on transformers, insulated conductors, and other components of electric utility systems.

Following are brief reports on the sessions that should be of specific interest to the electric utility engineers concerned with design and operation of transmission and distribution systems.

Conventional units

Two southern utility engineers presented papers on the advantages of conventional substation construction.

Paul R. Harris, of Southwestern Gas and Electric Co., Shreveport, La., reported that the use of conventional substation construction has many advantages in the territory served by Southwestern Gas and Electric Company. The major advantages are the flexibility in design to meet various requirements of application and the economies resulting because of favorable distribution voltages, availability of suitable substation sites, favorable relations with neighboring property owners, and an economic design.

The advantages of conventional substations in connection with maintenance and operations were discussed by Mr. Harris. Conventional substation design, he said, has always provided some means of allowing oil circuit breakers to be tested and given routine maintenance without interruption to service and without too much regard for weather conditions. A transfer bus is usually incorporated in each station and has been found very useful for many of the necessary load transfer occasions that arise. A transfer bus can be installed external to the station, but pole space, particularly adjacent to a station, is at such a premium that such an arrangement is impractical. A transfer bus is not a necessity, but it certainly has proven to be one of the advantages of conventional substation design.

Experience has shown that regulators require much more maintenance than transformers. A separate regulator can usually be switched out for maintenance at sometime during the load cycle without objectionable voltage regulation, or in a emergency be switched out entirely without interrupting service. Further, since both transformer and regulator are standard items, either one can be replaced easily without difficulty without requiring a large investment in spare equipment or spare circuit capacity.

In his summary, Mr. Harris concluded that conventional type substations still have an economic advantage in areas where the following conditions prevail: Suitable sites available at reasonable cost. Lines can be brought in overhead. Municipal regulations permit open type construction. Loads can be served at the higher distribution voltage. Standard economical designs and construction methods are used.

All of the above advantages are temporal in nature and must be continually evaluated.

A conventional substation can be constructed in a reasonable area.

Conventional design can hardly be "sold" on physical appearance but construction can be reasonably attractive or at least acceptable to neighboring property owners.

A. H. Thiermann, Jr., of Virginia Electric and Power Co., Richmond, pointed out that his company also prefers conventional substations. He described the area served by his company and discussed the design of conventional substations constructed recently. His company's reasons for preferring conventional construction were discussed under the headings of flexibility, easy maintenance, availability, and minimum investment.

Flexibility

The problem of future extension of the station is one that requires thorough consideration. The structure designs currently in use permit virtually unlimited expansion.

It is not always possible to predict all future changes. These designs are flexible enough to allow future alterations of almost any conceivable description. They offer maximum versatility of application to voltage and capacity changes. Circuit changes and equipment relocations and replacements are accomplished with a minimum of effort. Phasing changes are easily made where necessary.

Since many of our distribution systems of 4 kv and above are the conventional radial type, spare transformer capacity is desirable in the more remote areas. Where necessary, a spare transformer may quickly be connected to replace a failed unit.

If service requirements should change in the future, the station can be modified to furnish either bus or individual feeder regulation. It is often found desirable to add bus-connected static capacitors to a substation. This may easily be accomplished with the conventional type of station.

Easy maintenance

In any electric substation, it is necessary to make proper provision

for maintenance of the component items of equipment. The conventional station affords maximum visibility for inspection purposes. The three structures described in this paper offer accessability to all operating equipment. Equipment by-pass facilities are provided for inside the station.

Safe clearances permit general servicing and many changes can be made without deenergization of the entire station.

Availability

To meet unexpected needs, as well as take advantage of better pricing by the suppliers, these steel structures are frequently purchased several at a time. Because an entire substation can be taken from inventory and because engineering time is greatly reduced, erection of a new station can often begin within a few days after the need for it has been decided upon.

Minimum investment

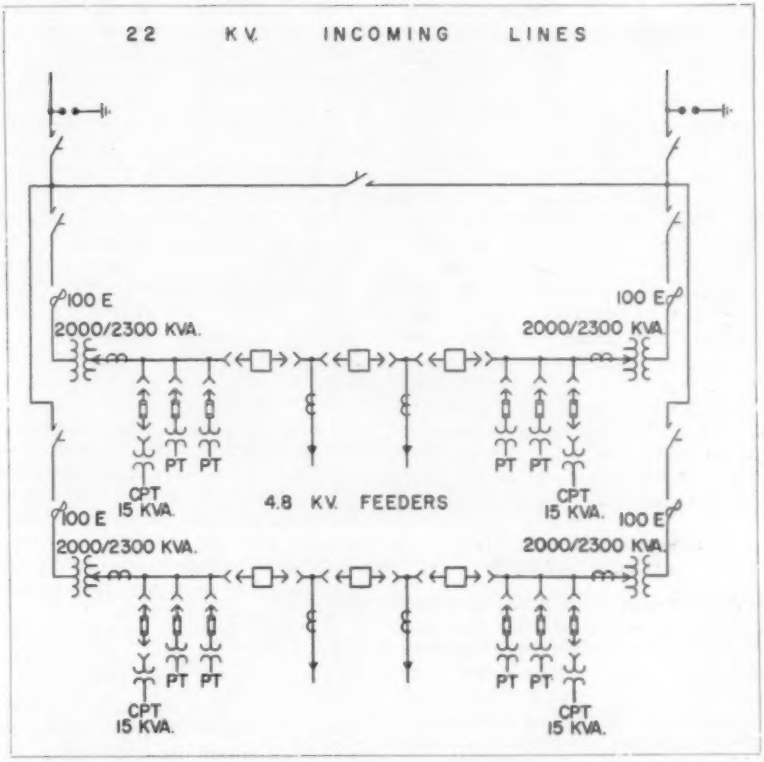
The simplified design employing wide-flange steel members reduces the amount of punching required and the number of parts and subassemblies, thus effecting savings in purchase price, as well as erection time.

The problem of painting assumes great importance when the galvanizing begins to reach the end of its life. A few large members are easier to paint than many small ones.

Standardization has long been recognized as an efficient tool for the lowering of design costs. Steel design and detailing are eliminated from the task of engineering while materials ordering is simplified. Delivery of the steel is speeded. In addition, standardization of the structure and footings allows a structure to be erected accurately and quickly by unskilled labor.

Obsolescence or inadequacy due to increased short-circuit or thermal requirements is more easily dealt with in the conventional station. Since transformers may easily be replaced, it is not necessary to tie up investment dollars in reserve capacity for future growth beyond that which may be foreseen in the near future.

There is a big advantage in maintaining a competitive state of pricing. Where expansion of existing facilities is required, it is not necessary to depend upon only one supplier to furnish the additional equipment as is often the case with



Continuity philosophy of Hartford Electric Light Company engineers led to the development of this duplex unit substation which is readily expandable to a multiplex arrangement.

unit substations. Neither is it necessary to purchase what is available in catalogs to obtain best prices.

The selection of one type of substation or another, Mr. Thiermann concluded, is essentially an economic problem. Such factors as initial cost, costs of conversion and expansion, flexibility, easy maintenance, and availability have been considered thoroughly. The Virginia Electric and Power Company has reached the general conclusion that substantial investment and operating savings can be realized in most cases through the use of the conventional outdoor substation rather than the unit type substation.

Unit substations

Preference for unit substation construction was expressed by D. C. Switzer, of Hartford Electric Light Co., Hartford, Conn., who was joined in his presentation by H. B. Wortman, of Westinghouse Electric Corp.

Mr. Switzer reported that a comprehensive study made by his company demonstrated that use of outdoor metal clad switchgear would result in the lowest over-all cost.

Several factors, he said, played an important part in determining the outcome of the study; among them are:

1. No expensive building was required.

2. HELCO — engineering, purchasing department, and installation man-hours required were significantly reduced.

3. Only equipment to cover present needs had to be installed initially. Future additions could be easily added as required.

Traditionally, the important loads in the HELCO area have been served with a single contingency philosophy to cover continuity. In other words, the design allows any one piece of equipment to fail without impairing service. Also, HELCO feeders had always been individually regulated.

These requirements led us first to the duplex design, shown in the diagram, which includes two transformers, two outgoing feeders, a secondary emergency tie and

required two subtransmission lines. The duplex design was easy to expand since the equipment necessary for two each two additional feeders came in an independent package.

A short time later, a requirement appeared for a station which would initially assume a load of 5000-6000 kva. In analyzing the economics, we began to question whether the duplex design was the best for our purpose. Other designs could be installed for a lower total cost but these designs did not have individually regulated feeders. Rather, the secondary supply bus was regulated. A study of feeder arrangements and requirements indicated that the feeders in this area were very similar and that bus regulation was practical.

Low voltage selective scheme installed

After much consideration, a low voltage selective scheme was installed. This design requires two incoming supply lines, has two automatic LTC transformers and two parallel lineups of switchgear which can be referred to as the "A" lineup and the "B" lineup. Each feeder has a breaker position on each bus, but is supplied with only one breaker. The feeder primary conductor ties between lineups are made with oil base insulated cable with neoprene jacket installed in underground duct. Relays, meters, controls and outgoing feeder potheads are contained in the "A" lineup cubicle. A small control panel in "B" lineup cubicle contains only a control switch with indicating lights to control the breaker when it is installed in the "B" lineup.

Starting with the transformer, each lineup has two auxiliary compartments which contain control and potential transformers; immediately adjacent is the transformer bank breaker and then comes the bus tie position, followed by the feeder positions. The tie breaker is normally open and feeder load can be allocated between the two transformers as desired. In some locations, it has been desirable to connect all load to one transformer and in others the load is divided and a portion carried on each transformer. An outage of subtransmission feeder results in automatic tripping of the bank breaker on the transformer supplied by it and closing of the bus tie breaker. Therefore, all station feeders are energized if either subtransmission feeder is alive.

The installations described above have been purchased in both the 5000 kva and 7500 kva size. We consider that a 5000 kva station can supply four distribution feeders; the 7500 requires six feeders to distribute the load. In some instances, the 7500 kva stations have been equipped with four feeders initially with two to be added when load growth dictates. All of the 5000 kva stations are purchased to allow a 7500 kva transformer to be substituted for the 5000 size and installed to allow the addition of future feeder positions.

Some of the reasons given by Mr. Switzer for selecting the low voltage selective type station were:

Allows an alternate source to be utilized with automatic throwover facilities in event of failure of one source. This could have been done with high voltage switching but at the cost of advantages given by the next three items below.

Provides duplicate equipment so that any one piece may fail without shutting the station down.

With few exceptions, all equipment in station can be inspected and maintained in a de-energized state.

While bus regulation at one level has been satisfactory in most cases, two levels (one on each bus) can be obtained if required.

Since the two transformers never operate in parallel, breakers of minimum rupturing capacity can be used.

Fault currents on system are held to reasonable levels.

Substation standards

A comprehensive paper on the subject of "Economic Advantages of Standard Substations," was presented by B. T. Payne, of Central Maine Power Co. He discussed what is meant by standards, and how standards are applied to substations, and discussed their application to some specific substation arrangements.

In the following excerpt from Mr. Payne's paper, the economic advantages of substation standards are discussed.

Designing and building a substation from scratch requires several distinct steps. The requirements to be met must first be specified, preferably with a general idea of the layout desired. This information must then be developed or designed into a workable pattern. The detailers then take over. They locate precisely every insulator, bus, switch and connection. They show amounts, sizes, clearances, and all the thousand and one details which go to make up the finished substation. Assembly prints then go to construction for their guidance in building the substation.

Manufactured parts and equipment will in general be selected from and conform to well-defined standards. These are our "fixed standards," and they will require few, if any, man-hours of design time. Items that must be designed and detailed specifically for the job, since it is the first of its kind,

Attendance of 5,340 at the 1958 Winter General Meeting of the American Institute of Electrical Engineers in New York was a new record in the seventy-four-year history of AIEE. Shown inspecting the daily tally of registrants are D. M. Quick, at left, general chairman of the meeting, and Walter J. Barrett, pesident of the Institute.

include the steel structures, foundations, assembly drawings, control house, switchboard and wiring diagrams.

Now, if substation standards are to have any economic advantage—save us any money—they must reduce our costs. They may reduce the cost of material and/or the cost of labor. The amount of material in any given substation is fixed within fairly narrow limits by its capacity, number of circuits, and general features. The use of standards as such, therefore, cannot reduce the cost of materials by any significant amount. But the cost of labor—the man-hours of engineering, designing, detailing, and construction time—is an entirely different story. This is the field in which standards really pay off.

An extreme example

Take an extreme case for example. A first-time job, conducted as described above, has been completed. For some reason an emergency now arises which requires a second substation exactly duplicating the first. Pressed for time we simply pull out our drawings, perhaps change the title, and construct the second substation from the drawings of the first.

What have we saved? We have eliminated entirely the man-hours of engineering for layout, development, and design as well as the man-hours of detailing and drafting. The saving in construction man-hours for this one-time repetition may not be noticeable, but certainly the erection crews should take no more time for the second job than for the first. Conceivably they might take less. In one instance, with foundations in place, a two-bay 33-4.16/33-12.47 kv distribution substation was erected, dressed up, and energized in just five regular working days. Familiarity with assembly details on the part of construction men played no small part in this achievement. As a matter of fact, it is our experience that the fast field erection resulting from the use of standard designs is one of the most valuable economics which results from the use of our standards.

Summing up this extreme case, we have reduced the man-hour cost by 75% or, conversely, we have done the job for 25% of the man-hours spent on the first job. In these days of engineering and technical man-power shortage this kind of a saving makes an inviting goal to shoot at. A paper on this subject was presented at the AIEE Winter Meeting a year ago.

Edison Gold Medal Presentation

The 1957 Edison Gold Medal was presented at the AIEE Winter Meeting to John K. Hodnette, second from left, executive vice-president of Westinghouse Electric Corporation and originally from Alabama, by J. H. Foote, second from right, AIEE senior vice-president. Introductory remarks to the presentation were made by Walter H. Sammis, left, president of Ohio Edison Co., who gave a history of the medal and Elgin B. Robertson, right, president of the Elgin B. Robertson Co., of Dallas and a former president of AIEE, who reviewed Mr. Hodnette's career.

Savings to be expected

Man-hour savings of 75% obviously may not be possible on every job for day-in, day-out work; but, on the other hand, there is little question that the system of substation standards developed and used in our office and shown in this paper have reduced our man-hours by at least 50% and probably more. Without assigning a dollar value to these savings, this means that we can either do a given amount of substation work with half the force, or we can do twice the work with the same force.

On steel for substation structures it has been estimated that the use of repetitive designs saves $25 to $30 per ton in cost of detail drawings. Where a number of like jobs can be put through the fabricating shop together, additional savings of perhaps $30 per ton may result. Finally, use of the same templates from job to job may save about $5 per ton. The total possible savings resulting from standardization may, therefore, amount to $60 to $65 per ton of steel.

Other definite advantages result from the use of standards although a value for the dollar sign may not be so readily assigned. Standards can materially reduce the time interval between project approval and cut-in dates. Both the steel fabricator and the manufacturer of air break and disconect switches are able to place orders directly into production when they have standard drawings on file for the equipment ordered. Back in the war and post-war days this sometimes meant a difference of months in equipment delivery.

An incidental and unplanned, though welcome, result of standardization has been the elimination of errors, particularly in steel structures. Erection of new designs is always watched closely for errors, misfits and chances for simplification. These points are then corrected or included on the drawings, and after one or two repetitions we end up with a set of details we know to be right. Not all the benefits of standardization have dollar signs.

We have defined standards and have looked into many features of

substations to which standardization may be applied. We have seen illustrations of these standards in practice and have noted some of the economic and other advantages resulting from the use of standards. The development of standards requires some effort, imagination, and ingenuity. But once developed and accepted, standards pay handsome dividends. We would not part with our standards at any price.

Mobile substations

Experience data on design and use of mobile substations was included in two presentations. One of these was a report by the Mobile Substation Working Group of the AIEE Committee on Substations. This progress report on the use of highway type mobile substations was based on replies to a questionnaire and covered 32 companies which had a total of 78 mobile units in use in 1955.

The purposes for which mobile units are used, listed in the order of importance, are equipment failures, scheduled maintenance, short-term construction (30 days or less), long-term construction (over 30 days), and temporary loads.

Here are pertinent facts about the use of these mobile units as deduced from tabulated replies.

As to location of mobile units when in actual use, most companies locate units either adjacent to substation or inside substation yard.

About half of the companies reported making use of permanent substation fence while the other half reported that temporary fences were erected.

As to grounding, the great majority reported temporary connection to existing grid or other ground.

Connecting mobile units

Methods of making connections to mobile units under various conditions are illustrated in the accompanying diagrams. The following excerpt from the progress report discusses procedure used in connecting the mobile units for service:

Few companies have programs in which all existing substations have been, and new substations are, reviewed in advance of the need for using a mobile substation to determine where the unit will be positioned and how and where connections will be made.

When a mobile substation is scheduled for use at a permanent substation for the first time, the connections may be left entirely to be determined by the field forces or some more definite plans may be agreed upon prior to the scheduled arrival of the mobile unit. Regardless of how the method of making the initial connections is arrived at, some additional information is then available which may be useful when a mobile unit is again used at this or similar permanent installations. However, this information appears to be seldom recorded or incorporated into permanent field or operating instructions.

If an emergency requires the use of a mobile, the method of positioning and connecting the unit is generally left entirely to the field forces at the time. If a mobile has been previously used at the location, the familiarity already gained makes the job easier.

There are two basically different ways of connecting a mobile unit to a permanent substation. First, the entire substation may be bypassed by making connections to the circuits as they enter and leave the permanent substation. This will permit de-energizing the entire permanent substation when load has been transferred to the mobile unit.

It should be noted that in this case the connections from the mobile may be made to the incoming and outgoing circuits where they connect to the substation equipment or may be made completely away from the substation. This is particularly true when riser cables are used to bring circuits into the substation and mobile connections are made at the overhead line end of the riser cables.

Connections may be made from the mobile unit to only one of the feeders. If the station to be worked on is a multiple feeder installation, the feeders are then usually tied together at regular emergency tie points. The low side breaker on the mobile is the only protection for all feeders and relay settings must be checked to be sure that adequate protection to the most remote sectionalizing device is obtained.

The second way is to by-pass only a portion of the permanent substation by making connections to some parts of the equipment. The best example of this would be to make connections to the mobile from the high and low voltage bus of the permanent substation, thus permitting a transformer bank to be de-energized. In this case the feeders from the substation would still be protected by their normal feeder breakers and relay settings would not be appreciably affected.

High voltage connections to the mobile unit are almost universally open wire and the mobile unit is usually positioned to keep the length of these connections to a minimum. Often the unit is positioned under the high voltage line entering the substation or adjacent to the portion of the substation from which connections are to be made so that no intermediate support of the leads is required. Hot line clamps are usually used for making connections.

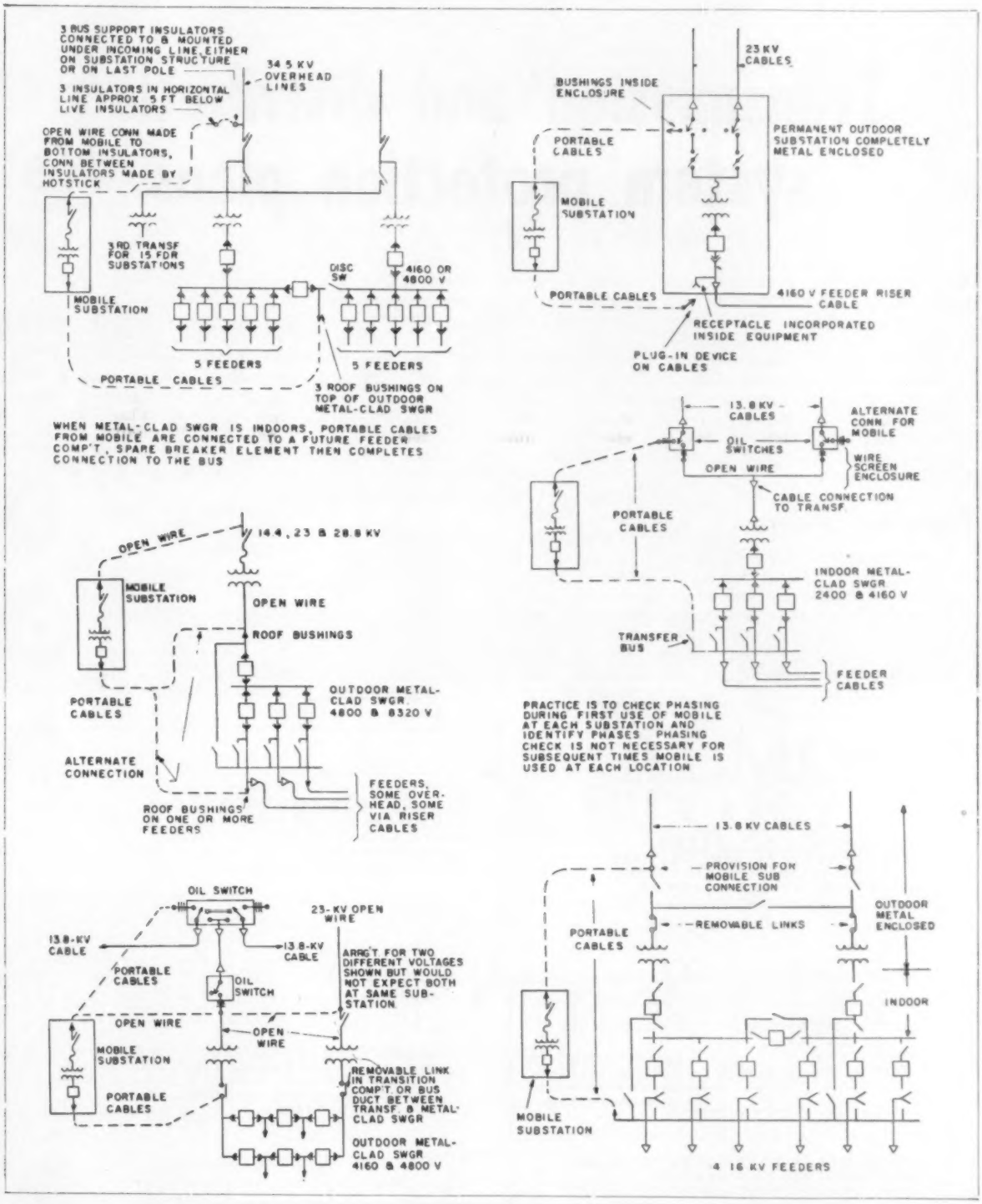
Another discussion relating to mobile substations was presented by M. R. Wallin, of Union Electric Co., St. Louis, who discussed both design and utilization. He reported that the Union Electric Company now has five mobile units of various capacities and voltage ratings in the distribution substation class.

All units are of the semi-trailer type because of the greater allowable weight and better maneuverability as compared with full trailers. Also, all units meet the legal weight and dimensional limits in the tri-state area of Missouri, Illinois and Iowa in which the company operates. This avoids the need for special permits, since blanket or annual permits are unobtainable.

In reviewing the usage to which these units had been put, Mr. Wallin gave the percentage of usage for four major categories in terms of days used as compared with total age of all units. These were as follows: emergencies, 7.5%; reconstruction, 8.6%; load or voltage relief, 17.2%; and maintenance, 20.0%.

It is interesting to note, he said, that the lowest percentage of usage is for emergencies. Seven cases of emergency use have been recorded, six of these being transformer winding failures and the seventh a transformer bushing failure.

Despite the relatively few cases, emergency use is a most important one. Prearrangements cannot be made, and mobile equipment does afford economical protection against lengthy outages following failure at locations where no other reserve is provided. Increased reliability of equipment, better protection and periodic preventive maintenance have, however, re-


3 BUS SUPPORT INSULATORS CONNECTED TO B MOUNTED UNDER INCOMING LINE, EITHER ON SUBSTATION STRUCTURE OR ON LAST POLE
3 INSULATORS IN HORIZONTAL LINE APPROX 5 FT BELOW LIVE INSULATORS
34.5 KV OVERHEAD LINES
OPEN WIRE CONN MADE FROM MOBILE TO BOTTOM INSULATORS, CONN BETWEEN INSULATORS MADE BY HOTSTICK
3RD TRANSF FOR 15 FOR SUBSTATIONS
DISC SW
4160 OR 4800 V
MOBILE SUBSTATION
5 FEEDERS
5 FEEDERS
PORTABLE CABLES
3 ROOF BUSHINGS ON TOP OF OUTDOOR METAL-CLAD SWGR
WHEN METAL-CLAD SWGR IS INDOORS, PORTABLE CABLES FROM MOBILE ARE CONNECTED TO A FUTURE FEEDER COMP'T, SPARE BREAKER ELEMENT THEN COMPLETES CONNECTION TO THE BUS
23 KV CABLES
BUSHINGS INSIDE ENCLOSURE
PERMANENT OUTDOOR SUBSTATION COMPLETELY METAL ENCLOSED
PORTABLE CABLES
MOBILE SUBSTATION
PORTABLE CABLES
4160 V FEEDER RISER CABLE
RECEPTACLE INCORPORATED INSIDE EQUIPMENT
PLUG-IN DEVICE ON CABLES
OPEN WIRE
14.4, 23 & 28.8 KV
MOBILE SUBSTATION
OPEN WIRE
ROOF BUSHINGS
PORTABLE CABLES
OUTDOOR METAL-CLAD SWGR. 4800 & 8320 V
ALTERNATE CONNECTION
ROOF BUSHINGS ON ONE OR MORE FEEDERS
FEEDERS, SOME OVERHEAD, SOME VIA RISER CABLES
13.8 KV CABLES
ALTERNATE CONN FOR MOBILE
OIL SWITCHES
WIRE SCREEN ENCLOSURE
OPEN WIRE
CABLE CONNECTION TO TRANSF
PORTABLE CABLES
INDOOR METAL-CLAD SWGR 2400 & 4160 V
TRANSFER BUS
FEEDER CABLES
PRACTICE IS TO CHECK PHASING DURING FIRST USE OF MOBILE AT EACH SUBSTATION AND IDENTIFY PHASES. PHASING CHECK IS NOT NECESSARY FOR SUBSEQUENT TIMES MOBILE IS USED AT EACH LOCATION
OIL SWITCH
23-KV OPEN WIRE
13.8-KV CABLE
13.8-KV CABLE
ARR'T FOR TWO DIFFERENT VOLTAGES SHOWN BUT WOULD NOT EXPECT BOTH AT SAME SUBSTATION
PORTABLE CABLES
OIL SWITCH
OPEN WIRE
OPEN WIRE
MOBILE SUBSTATION
PORTABLE CABLES
REMOVABLE LINK IN TRANSITION COMP'T OR BUS DUCT BETWEEN TRANSF. & METAL-CLAD SWGR
OUTDOOR METAL-CLAD SWGR 4160 & 4800 V
13.8 KV CABLES
PROVISION FOR MOBILE SUB CONNECTION
REMOVABLE LINKS
OUTDOOR METAL ENCLOSED
PORTABLE CABLES
INDOOR
MOBILE SUBSTATION
4 16 KV FEEDERS

Examples of methods used to make connections to mobile substations under various substation design conditions

sulted in fewer major equipment failures.

Connection of mobile units during reconstruction or station expansion represented the next to the lowest usage. By-passing the permanent station with a mobile unit avoids the need for working on or around energized equipment, thereby promoting safety and timesaving. In many cases, overtime work is avoided.

The installation of mobile units to provide feeder or substation capacity relief, or for feeder voltage relief accounted for next to the highest usage. The number of

(Continued on page 122)

Transmission and distribution system protection plans

◆ A WIDE RANGE of papers were presented in several different technical sessions of the AIEE Winter Meeting that could be classified under this general heading. Some of the topics discussed related to high voltage circuit breakers, reclosing equipment for use on 46 kv lines, compensator distance relaying, and a protection plan for distribution feeders.

Protecting feeders

Three engineers of Public Service Company of Colorado, J. R. Hayden, J. E. Martin, and R. L. Tilson, joined in the presentation of a paper describing a "Protection Plan for Distribution Feeders."

Several years operating experience with 7.6/13.2-kv feeders, the authors reported, revealed that (1) the substation breaker cannot adequately protect an entire feeder because an outage involves too many customers and too large an area; (2) the majority of the faults occurring on a feeder will be located on its latterals; and (3) automatic sectionalizing devices located in feeder main circuits limit operating flexibility and are subject to premature overloading due to load growth.

A general solution to these problems was found in a plan, the basic idea of which is to provide devices to automatically isolate each faulted lateral or distribution transformer from the main circuits of the feeders.

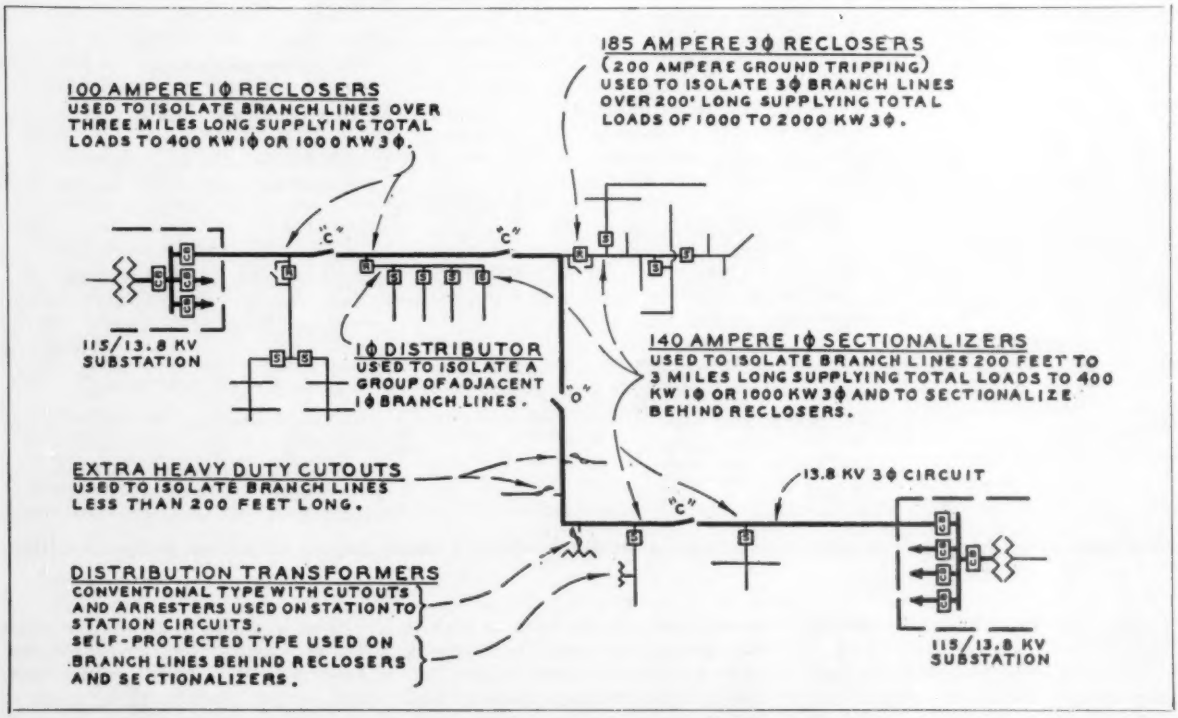
Only one size each of single-phase sectionalizers, single-phase reclosers, three-phase recloser, and fuse cutouts is used. The application of these devices is standardized in terms of branch circuit load, length, and type of exposure, the authors said (see accompanying diagram).

There are no automatic devices installed in the main circuit of the feeder but the main is protected from each branch circuit as follows:

Three-phase branch circuits over 200 feet in length, supplying loads of 1000 to 2000 kw are isolated by three-phase reclosers.

Branch circuits over three miles in length, supplying loads to 400 kw single-phase or 1000-kw three-phase are isolated by single-phase reclosers.

Branch circuits 200 feet to three


185 AMPERE 3Φ RECLOSERS
(200 AMPERE GROUND TRIPPING)
USED TO ISOLATE 3Φ BRANCH LINES OVER 200' LONG SUPPLYING TOTAL LOADS OF 1000 TO 2000 KW 3Φ.
100 AMPERE 1Φ RECLOSERS
USED TO ISOLATE BRANCH LINES OVER THREE MILES LONG SUPPLYING TOTAL LOADS TO 400 KW 1Φ OR 1000 KW 3Φ.
"C"
"C"
115/13.8 KV SUBSTATION
1Φ DISTRIBUTOR
USED TO ISOLATE A GROUP OF ADJACENT 1Φ BRANCH LINES.
"O"
140 AMPERE 1Φ SECTIONALIZERS
USED TO ISOLATE BRANCH LINES 200 FEET TO 3 MILES LONG SUPPLYING TOTAL LOADS TO 400 KW 1Φ OR 1000 KW 3Φ AND TO SECTIONALIZE BEHIND RECLOSERS.
EXTRA HEAVY DUTY CUTOUTS
USED TO ISOLATE BRANCH LINES LESS THAN 200 FEET LONG.
13.8 KV 3Φ CIRCUIT
"C"
DISTRIBUTION TRANSFORMERS
CONVENTIONAL TYPE WITH CUTOUTS AND ARRESTERS USED ON STATION TO STATION CIRCUITS.
SELF-PROTECTED TYPE USED ON BRANCH LINES BEHIND RECLOSERS AND SECTIONALIZERS.
115/13.8 KV SUBSTATION

Details of distribution feeder protection plan developed by Public Service Company of Colorado.

Westinghouse

SPACE-MISER

NETWORK TRANSFORMER

This is a modern design network transformer produced to the exacting requirements of modern network systems. It provides high utilization kva together with greater reliability, reduced maintenance and simplified inspection. It affords the reserve ability necessary for emergency operating conditions. The SPACE-MISER, with its greatly reduced size, is made possible through advanced engineering, materials and manufacturing techniques developed by Westinghouse Transformer Division.

FIRST WITH THE FUTURE

THE DECAL TELLS ALMOST THE FULL STORY

The decal reproduced above is applied to every Westinghouse SPACE-MISER network transformer. It tells almost the full story . . . almost—but not quite. What it doesn't tell is that:

The new SPACE-MISER has been reduced *12 inches* in height—it can now be mounted off the floor of the vault.

The new SPACE-MISER weighs *20% less*—installation is easier, faster; handling is safer.

The new SPACE-MISER occupies *15% less* vault space—less cramped vaults mean easier maintenance.

The SPACE-MISER is another example of how Westinghouse Plowback of Earnings—into research . . . and development of better materials with more efficient utilization of existing materials—produces the improvements that set the pace in helping electric utilities keep electricity America's biggest bargain.

You can get the full story of what the SPACE-MISER offers for *your* network operations by calling your Westinghouse sales engineer . . . J-70854

YOU CAN BE SURE... IF IT'S Westinghouse

miles in length, supplying loads to 400-kw single-phase or 1000-kw three-phase are isolated by sectionalizers. If the branch circuit has hazardous exposure, such as bad tree conditions, single-phase reclosers are used.

Branch circuits less than 200 feet in length are isolated by cutouts.

Branch circuits isolated by reclosers are subdivided with sectionalizers if warranted by the load, importance, and relative exposure of the different parts of the circuit.

Along the main circuit of the feeder, distribution transformers of the conventional type with separate arresters and cutouts are used in order to protect the main from transformer bushing faults. Self-protected type distribution transformers are used on branch circuits behind sectionalizers, reclosers, and cutouts.

As local geography permits, new branch circuits and extensions are planned to effectively load the sectionalizing devices and to keep the number of taps to the main to a minimum. Preference is given to feeder patterns which result in taps to the main large enough to justify reclosers rather than smaller taps each protected by sectionalizers. Since reclosers interrupt fault currents independently, while sectionalizers depend upon the station breaker to interrupt fault currents, the use of reclosers to protect taps to the main minimizes annoying interruptions to the entire feeder.

The plan does not specify devices for branch circuits loaded in excess of 2000 kw because the main circuit of the feeder is extended to these loads. Similarly, protection for single-phase branches loaded in excess of 400 kw is not specified since loads of this magnitude are served with three-phase laterals.

Distance relaying

Seven Westinghouse engineers joined efforts in presenting a three-part comprehensive treatment on Compensator Distance Relaying. W. K. Sonnemann and H. W. Lensner discussed the general principles of operation of this device; W. E. Rich and H. J. Calhoun discussed its design and performance; while Mr. Lensner, P. J. Schwanenflugel and W. L. Hinman discussed the use of this device in connection with a carrier system.

The compensator distance relaying scheme described in these papers, the authors claimed, is a new and different approach to the problem of relaying interphase faults on transmission lines. It is a high-speed distance relaying scheme, for use with or without power-line carrier or microwave, and is responsive to all types of faults except single-phase-to-ground.

The compensator scheme is quite different from conventional distance relaying in that no one relay can be thought of as being assigned to any particular phase. In this new system, one polyphase relay unit responds to all phase-to-phase faults, regardless of which pair of phases is faulted. The other polyphase unit responds to three-phase faults. Between the two of these units, one or the other will respond to any two-phase-to-ground fault, regardless of which pair of phases is involved. The practice of using polyphase units for distance measurement is new and in contrast to the prior art, where single-phase units were used.

The system receives its name from the compensators which are a vital component of the system. The compensators, which are essentially air-gap transformers with current-energized primary windings and voltage secondary windings, give current-derived voltages which are subtracted from the system voltages at the relay location. The net voltages so obtained are then applied to a high speed induction cylinder relay unit which develops either closing or opening torque, depending on the type and location of the fault.

Relay unit

The induction cylinder relay unit used in the compensator relaying scheme is basically a polyphase induction motor. To review briefly certain fundamental principles of polyphase motor operation, if a three-phase motor having terminals marked a, b, and c is connected to a three-phase system having phase sequence abc, the shaft of the motor will rotate in a given direction. If now two of the phase leads to the motor are reversed, such that the phase sequence of the applied voltages is acb, then the direction of rotation of the motor will be in the opposite direction to the first. Finally, if two of the motor leads, such as phases b and c, are tied together solidly and a single-phase voltage applied from that point to the remaining terminal, then the motor will not start on this single-phase voltage.

The cylinder unit is arranged as a polyphase motor working on a voltage supply and these principles are used. Under normal conditions, without a short circuit on the system, and with the given normal phase sequence of abc, the cylinder unit develops a starting torque in the contact-opening direction by design. This is normal operation. When a fault occurs beyond the balance-point setting of the relay, the voltages applied to the cylinder unit remain of normal phase sequence abc, and the cylinder unit maintains its contacts open. When the fault exists at the balance point, then the voltages applied to the cylinder unit are reduced to a single-phase condition, and no torque is developed in either direction. When a fault exists on the transmission line between the relay and the balance point, then the phase sequence of the voltages presented to the cylinder unit are of negative phase order (acb); hence the relay develops a torque in the contact-closing direction and the contacts close. When a fault occurs behind the relay location, the phase sequence of applied voltages remains abc, and the relay does not close its contacts.

The cylinder unit has four poles and two sets of coils. Coils on diametrically opposite poles are connected in series to form one phase winding. The circuit connections are such that the two coil circuits are connected in two legs of the star-connected system (with a floating star-point) energized from three-phase quantities. Thus, the cylinder unit uses two voltages of the three-phases available on a three-phase system, and operates as a three-phase motor.

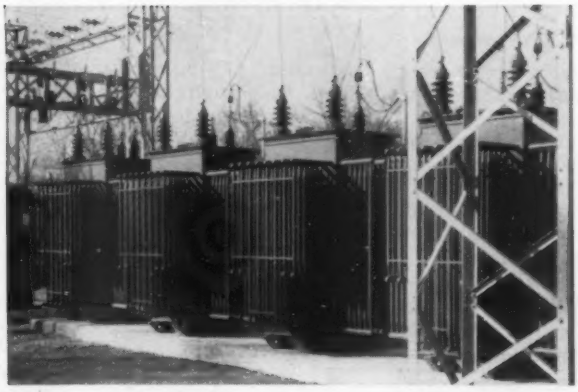
The advantage claimed for the new distance relaying system is that the use of fewer relay units will result in increased circuit simplicity and greater reliability. As the compensator relays are inherently directional, the coordination problem is simplified.

Gas-filled breaker

E. B. Henry, of Gulf Power Co., Pensacola, Fla., in association with Westinghouse engineers R. E. Friedrich and F. L. Reese, reported on service experience and staged field tests on the 115 kv, 1000 mva gas-filled power circuit

Mr. W. H. Brown, right, reviews plans with Kuhlman salesman, Andrew H. Baxter.

"EXCELLENT PAST EXPERIENCE . . . *that's why we specified Kuhlman"*



Doswell, Virginia looks ahead. When planning this four Kuhlman power transformer substation, approximately 50% reserve capacity was allowed for future growth.

"We particularly like the design of Kuhlman transformers," says W. H. Brown, Manager of the above installation at Doswell, Virginia.

"They are rugged in construction and generously provide all the features we consider important.

"We are also impressed with their height, which solves our problem of maintaining required ground clearances.

"Then, too, delivery was according to schedule which, in itself, is no little consideration."

This installation of three Kuhlman single phase power transformers, plus a spare, serves the growing rural and small industrial community of Doswell, Virginia. Although some of the load is polyphase, single phase units are used rather than three phase to give greater versatility for serving the system's single phase farm and residential lines.

Like Mr. Brown, you'll find Kuhlman small power transformers meet all your requirements —especially those features important to you.

KUHLMAN ELECTRIC COMPANY

General Offices: Birmingham, Michigan

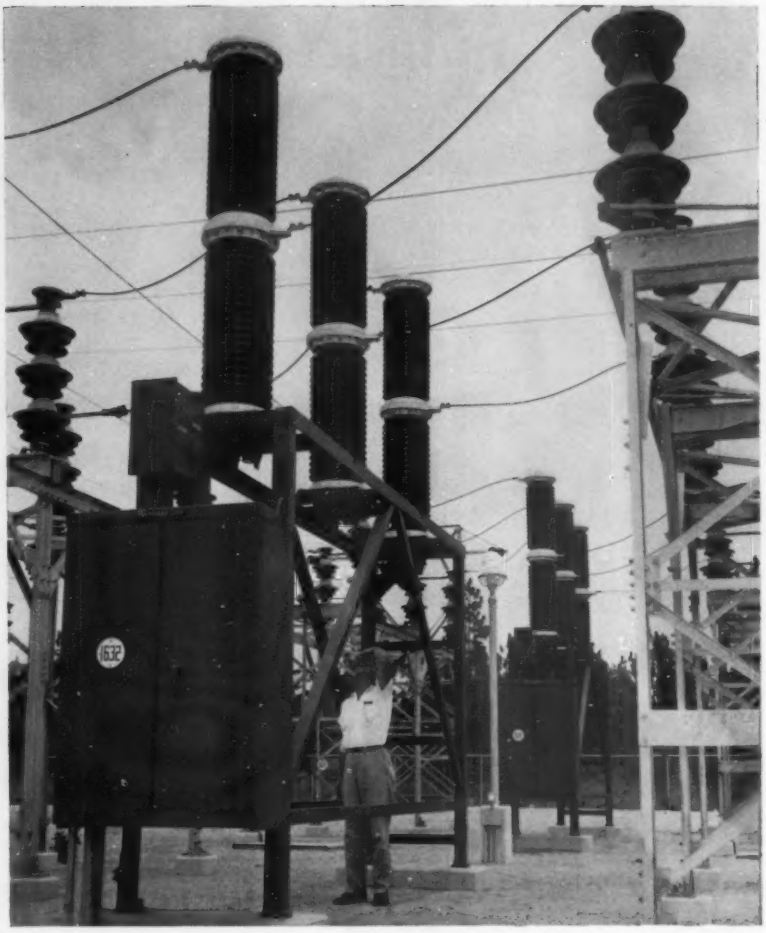
SOUTHERN DIVISION • CRYSTAL SPRINGS, MISSISSIPPI

breaker installed on the Gulf Power system. The staged tests included both line dropping tests and fault tests.

The over-all performance, reported the authors, demonstrated by the 1150-SF-1000 breakers on the Gulf Power System confirmed all expectations based upon results obtained during development in the High Power Laboratory. This was evidenced by the fact that no restrikes were obtained on any of the line-dropping operations, and by the short interrupting times on the fault tests. The excellent condition of the contacts, following the tests and the several months of service which included two automatic fault clearing operations, was such as to require no maintenance.

The record of no appreciable loss in gas pressure since initial installation of any one of the three breakers on this system indicated the feasibility of designing such a breaker with gasket seals. The ease of inspection and maintenance of the contacts was demonstrated by the short time required to open up the pole unit, remove the contacts, examine and replace them, and reseal the pole unit.

In view of the performance of the gas-filled circuit breaker in the course of these tests and its condition upon subsequent inspection, it was adjudged by representatives of both the manufacturer and the user to be suitable for service up to its interrupting rating.



Service experience and staged tests on these 115-kv gas filled circuit breakers, installed on the power system of Gulf Power Co., Pensacola, Fla., indicated their suitability for service up to 1000 mva.

Automatic recloser

A 46 kv automatic circuit recloser having a continuous current carrying capacity of 400 amperes and the ability to clear a 250 mva fault in two cycles at rated voltage was described in a paper presented by E. J. Field, of I-T-E Circuit Breaker Co., Greensburg, Pa.

The author pointed out that there is an upward trend in the level of distribution voltages, and that in some instances subtransmission circuits are serving very much like distribution circuits. It is believed that benefits will accrue from the application of reclosers, with their self-contained operating characteristics, to these higher voltages.

It is believed that the new apparatus will supplement rather than replace existing equipment. It would be applied where present fault handling switchgear is too complex and hence too expensive to be justified and where power fuses lack the beneficial characteristics of being able to clear transient faults and sustain the continuity of service. There are applications on subtransmission circuits where single-phase high voltage reclosers will prove desirable if cost can be kept low.

A general objective was established emphasizing simplicity for the reason of achieving minimum cost but not to compromise reliability and durability. The low cost objective would be met by eliminating every possible extra auxiliary, such as tank lifters, oil metering and sampling devices, reverse current sensitivity, distance relaying, multi-pole operation, and by confining the design initially to single-pole construction. The omitted elements, it was believed, should be a part either of existing alternate equipment or of a design extension of the proposed basic single-pole high voltage recloser.

Performance tests indicate that the established project objectives have been attained, making available to power companies a true 46 kv automatic recloser with 400 ampere continuous current carrying capacity, and two cycle 250 mva fault clearing capacity. It is believed that this apparatus, together with interchangeable coils for lower continuous current ratings, introduces an exceptionally useful and economical tool for the protection of subtransmission lines.

Reclosing breaker

Another piece of equipment offered as a solution to problems encountered in the protection of subtransmission or "middle voltage"

(Continued on page 120)

Copperweld* Type M Guy Strand offers double economy: 1. lower first cost, 2. lower maintenance costs. Research and new production techniques make it possible for us to manufacture Type M at savings which are passed on to you. The result is Copperweld quality costing you less than before. And the savings don't end after installation. They continue year after year because Type M Guy Strand requires so little maintenance. It will last as long as modern poles.

Seven strengths are available: 2.2M, 4M, 6M, 8M, 10M, 12.5M and 16M. Easy to handle—easy to install, Type M Guy Strand can be readily bent, served, moused or clamped. Write us today for complete information about this new product and its money-saving features.

*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

New Copperweld TRADE MARK
TYPE M GUY STRAND

2.2M 4M 6M 8M 10M 12.5M 16M

New watthour meter design saves money for utilities

◆ A NEWLY DEVELOPED watthour meter for measuring energy in two phases of a 4-wire, three-phase Y system is expected to find wide application for metering apartment dwellings in areas served by 120/208 volt networks. The addition of major appliances in such dwellings such as room air conditioners, ranges, water heaters, etc., has necessitated 3-wire, 208 volt service and the use of a two-stator polyphase type of watthour meter.

Phase shifting employed

The new meter, described in a paper presented by A. M. McQuarrie, General Electric Co., consists essentially of a double current coil, single phase meter with inductance-resistance phase-shifting networks connected in the current coil circuits. In each phase, the current is divided, with a portion passing through the current coil of the meter and the balance shunted around the current coil. The potential coil is connected acoss the lines.

The nature of the load is such that both 208 volt line to line, and 120 volt line to neutral loads must be metered. Under unity power factor conditions the current in the 208 volt load is in phase with the voltage applied to the potential coil of the meter. The current in the 120 volt line to neutral loads, however, is out of phase with the potential coil voltage.

By choosing the proper values of inductances and resistances in the networks, the current in the current coils of the meter are adjusted in magnitude and phase angle, so that for 120 volt loading, the current fluxes have the following relationships, which are required for accurate metering:

(1) They are in phase with each other.

(2) They are 90° out of phase with the potential flux.

(3) They are a predetermined ratio to the line currents.

In the case of 208 volt line to line loads, the currents in the current coils are no longer in phase with the voltage applied to the potential coil. At unity power factor load, the current in one current coil leads the voltage by approximately 30°, while the current in the other current coil lags the voltage.

In the development of this meter, the networks had to be made small and compact in order to keep the resistance low and the heating losses within acceptable limits. The minimum size of the reactors, however, is limited by the wire size necessary to carry the current without excess heating, the number of turns, the cross-sectional area of iron, and the air gap which is necessary to minimize the effect of the change of permeability of the iron with change of current. Furthermore, the reactors are proportioned to make use of the change of permeability with change of current for load compensation purposes.

The low impedance of the branches of the L-R networks (in the order of .003 ohms) requires that the contact resistance at the junction be kept very low and not change in service. For this reason, the connections are permanently silver brazed in the factory. Adjustment of the individual load curves for phase balance and power factor is done at the factory. Field adjustment is limited to the usual full load and light load screws, which affect both phases together.

Phase sequence

Unlike conventional two-stator meters, this meter will register line to neutral loads accurately only if the phase sequence is positive. Therefore precautions are required on installation to be sure that the phase sequence is correct. In addition, it is necessary to assure that the phases are not reversed in service due to wiring changes in other parts of the system.

In order to take care of this problem, one model of the meter is being developed with a phase rotation indicator built in in the form of a neon glow lamp which glows if the phase sequence is in the wrong direction.

Thus, the meter installer is able to determine readily at the time of installation, whether the phase rotation is correct. If by any chance the phase sequence should become reversed, due to wiring changes in other parts of the service, the neon lamp will glow and warn of the condition.

The author indicated that this meter is proposed for domestic network system loads, where voltages are balanced, and power factor is normally higher than 0.75. Such loads include window-type air conditioners and major electric appliances, as well as small loads such as clocks and night lights. The smaller loads will be applied on individual phases, whereas the heavier loads will normally be on both phases. The performance is shown to compare very favorably with more costly two-stator meters.

Printing demands

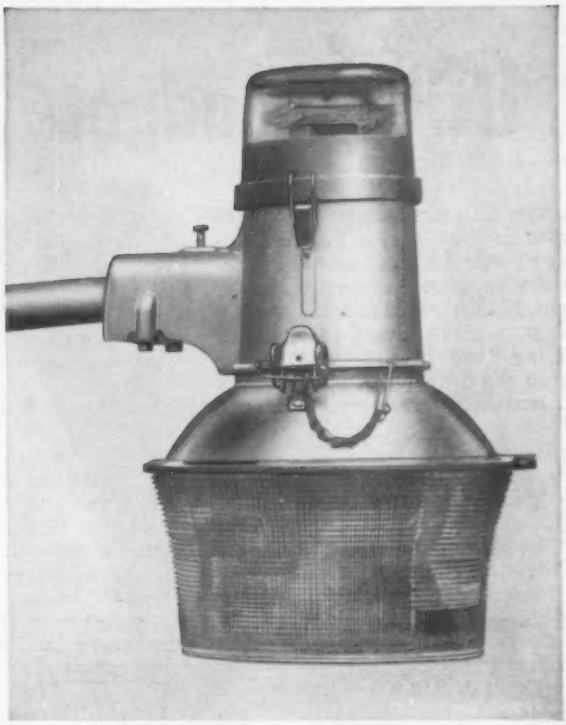
The development of a new printing demand meter, costing less and smaller and more accurate than its predecessors, was reported by P. V. Terry, of General Electric Co., who described the new meter in a paper presented before a session on indicating and integrating instruments. The accuracy of the new meter, he said, is compatible to that of the watthour meter which acts as the primary sensing device and impulse generator for the printing demand meter.

Mr. Terry points out that three times the amount of electrical energy was sold in 1957 as in 1947 and that usage will almost triple again by 1970. Likewise, he said, in metering kilowatt demand the energy used during the demand intervals has been increasing. On large connected loads where an impulse operated printing demand meter is used to obtain a permanent demand record, each impulse can represent an extremely large number of kilowatts which in some cases may be considered excessive for good metering practice.

A printing demand meter capable of accepting an increased number of impulses per demand interval became necessary to reduce the kilowatt value of each impulse. Impulses which up to now had been lost during the print and reset operation of the demand meter are important and should be recorded to improve the accuracy of demand measurement and customer billing.

L-M Suburbanaire Gives Protection, Adds Off-Peak Load

Utilities rent customers this photocell-controlled luminaire at about $3 a month; it provides all-night lighting for security and recreation; increases revenue for the utility. Open-type refractor keeps maintenance at minimum.



A number of utility companies have had excellent results with a new plan for individual outdoor lighting for customers. Here, briefly, is the plan:

- The utility installs the L-M Suburbanaire on the customer's premises without charge. The Suburbanaire is an open-type, low-cost luminaire with built-in photocell control, thus providing all-night yard lighting.
- The utility maintains the unit and keeps it in operation.
- The utility provides power which does not go through the customer's meter.
- Cost to the customer is a stated amount per month—usually $3 or $3.50—which covers all costs. The utility retains ownership of the luminaire.

Customers like the plan, because it safeguards property, cuts vandalism and theft, reduces accidents, and has some prestige value, particularly in areas where there is no street lighting.

From the utility standpoint, the plan increases revenue in off-peak hours. Here is what some utility men say:

"We have installed more than 200 L-M rural lights, increased our off-peak load by more than 50 kw, and have had many expressions of complete satisfaction from our customers."

"The Photocell Suburbanaire assures us of an off-peak load of about 1000 kw hours per unit. We have installed almost 400 Suburbanaire luminaires, many of these replacing the old makeshift radial fixture arrangement. Customer reaction has been excellent . . . equipment and gasoline theft has dropped substantially and vandalism is almost nil."

"From time to time, customers have asked us for outdoor lighting for rural and suburban homes. Since January, 1957, we have been installing L-M's new Suburbanaire unit. The long-life lamp and photo-electric cell, plus ease in relamping and cleaning the open refractor, will keep our maintenance costs at a very low minimum. This makes it possible to offer this service at a very low cost."

TYPICAL ANALYSIS OF COSTS

Material:	
Suburbanaire, photocell, bracket, etc.	$ 70.00
Installation labor	30.00
Annual power cost (based on 300 watt lamp burning 4000 hrs. per year @ 1¢ kwh)	12.00
Lamp replacement, maintenance	9.00
Total Cost First Year	**$ 121.00**
Outdoor lighting equipment is built to last 20 to 25 years, but if this equipment is amortized over 10 years, the cost will be:	
First-year cost (above)	$121.00
Nine times power and maintenance cost (9 more years) 9 x ($12 + $9)	189.00
10-year total	$310.00
Interest at 6%	18.60
Profit, at 10% on $328.60	32.86
Total 10-Year Cost Plus Profit	**$ 361.46**
Annual cost (1/10th)	$ 36.15
Cost per month (1/12th)	$ 3.01

Get The Whole Story

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LINE MATERIAL Industries Outdoor Lighting

McGRAW-EDISON COMPANY

Utility budgets at all-time high

◆ THE LARGEST construction program in the Georgia Power Company's history was announced recently by J. J. McDonough, president. Mr. McDonough said the company would invest $58,800,000 during 1958 in new facilities to serve the growing power needs of its customers. This compares with about $52,000,000 spent during 1957.

Among the larger items in the company's construction budget are:

Completion of a 125,000-kilowatt generating unit at Plant Yates near Newnan, and a connecting 230,000-volt transmission line to Morrow south of Atlanta. This will require $5,800,000 in 1958 out of a total cost of $18,800,000. The new generating unit, the fifth to be installed at Plant Yates, will come into service next June.

Work will be continued on Oliver Dam, a 60,000-kilowatt hydroelectric plant on the Chattahoochee river at Columbus. The estimated cost is $13,900,000, of which $8,100,000 will be spent in 1958. The plant will be completed next year.

Construction will go forward on a new steam-electric generating unit of 75,000 kilowatts at Plant McManus, near Brunswick, which will increase the plant's capacity to 115,000 kilowatts. This project was begun in 1957. More than $8,400,000, of a total cost of $15,300,000, will be spent in 1958.

Georgia Power Company will invest an additional $1,000,000 in the Southern Electric Generating Company, which is constructing a 1,000,000 - kilowatt steam - electric plant near Wilsonville, Ala. Southern Electric Generating Company is jointly owned by Georgia Power Company and Alabama Power Company. The first two of four 250,000-kilowatt generating units will come into service in 1960.

The redevelopment of the Morgan Falls hydroelectric project on the Chattahoochee river north of Atlanta will begin this year. The height of the dam is being raised to provide additional water storage capacity for stream flow regulation. Of an estimated $1,000,000 required, $680,000 will be spent in 1958. The City of Atlanta will pay half the cost of the redevelopment project.

Transmission projects

Additional electrical transmission facilities to serve the Waycross area will require $420,000. These include a 10.5-mile, 66,000-volt line from Blackshear to Hoboken, a new substation at Blackshear, and an increase in the capacity of the Kettle Creek substation at Waycross.

A 230,000-volt transmission line extending 81 miles from Bonaire south of Macon, to Tifton, will be constructed in 1958. This is an extension of the Plant Yates-Bonaire line, built in 1957, the first 230,000-volt line ever constructed in Georgia. The cost of the extension, including a 125,000-kilowatt substation in Tifton, will be $2,800,000.

A 12,000-kilowatt, 110,000-volt substation under construction at Ochlochee will be completed this year. The total cost is $391,000, of which $247,000 will be required in 1958.

A 110,000-volt transmission substation will be built at Ringgold with 3.5 miles of connecting 110,000-volt transmission lines, at a cost of $220,000.

A 110,000-volt substation will be built on the north side of Columbus with connecting 110,000-volt transmission lines, at a cost of $300,000.

Construction will begin on a new 40,000-kilowatt substation with connecting 110,000-volt and 19,000-volt transmission lines in the West End section of Atlanta. The total investment will be $580,000, of which $250,000 will be spent in 1958.

A 36,000-kilowatt, 110,000-volt substation under construction in the northern section of Atlanta will be continued. Of a total investment of $1,150,000, $460,000 will be spent in 1958.

A 39-mile transmission line of 110,000 volts will be built from Douglas to Waycross with terminal facilities at both cities, at a cost of $821,000.

A 5.5-mile transmission line, of 44,000 volts, will be built from Red Oak to Union City at a cost of $108,000.

Service building planned

Construction of the company's general service headquarters building at Forest Park near Atlanta will be continued in 1958. The total cost is estimated at $3,700,000, with $2,600,000 being scheduled this year. The project will be completed in 1959.

Substations and connecting transmission and distribution lines will be built at Lavonia, Gainesville, Tarver, the Clark Hill reservoir area, Forest Park, Summerville, Donaldsonville, Crawfordville, Culloden, Hawkinsville, Dublin, Valdosta, Reidsville, Stone Mountain, Orange, and Flat Shoals Avenue, Atlanta, at a combined cost of $1,500,000.

Transmission substations will be enlarged at Manchester, Pine Grove (Valdosta), Grady (Atlanta), Chickamauga, Summerville, Thomaston, Dalton, South Macon, East Point, LaFayette, Tifton, Morrow, and Winder, and at the Bartletts Ferry, Goat Rock, Terrora and McManus generating plants. The combined cost will be $1,500,000. Other improvements to the transmission system will add up to $946,000.

Electric line extensions to serve new customers, including substations, transformer and metering equipment, will cost $16,800,000. Other electric distribution expenditures will total $5,500,000.

About $19,000,000 will be paid in wages and salaries to the company's operating employees, all of whom live in Georgia.

The company's tax bill is estimated at $27,000,000. This money goes to state and local governments for the support of public schools and other public services and to the federal government.

MP&L budget at peak

MISSISSIPPI Power & Light Company has announced a 1958 construction budget nearly twice as large as the current 1957 budget—and the second largest in the history of the Company.

Total construction planned for next year will amount to $19,185,950.

(Continued on page 120)

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Heart of the versatile Faultmaster Fuse Cutout is the small bore, fibre-glass reinforced, single vented fuse tube. This minimum inner diameter fuse tube of maximum mechanical strength assures positive expulsion action necessary for the safe, sure, instantaneous arc interruption.

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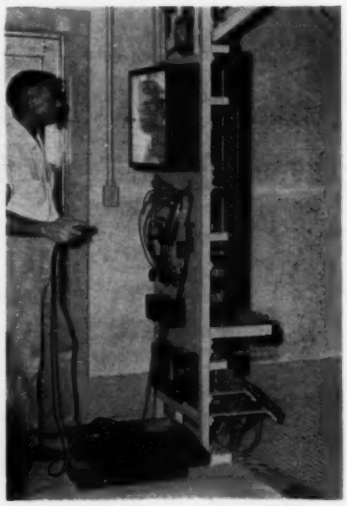

Understanding vectors as applied to apparatus connections

By E. B. Henry
Relay Engineer, Gulf Power Company
Pensacola, Fla.

Part 5

Relay connections

In taking up relay connections the ubiquitous non-directional overcurrent relay, whether for phase or ground protection, will be passed over on the basis that anyone would have to go to considerable trouble to get this relay connected incorrectly, although I do admit having seen it done. The current polarized directional ground relay follows the non-directional closely in this respect, and will therefore not be taken up in detail.

Directional O.C. relays—phase protection

In the category where the relative angular positions of voltage and current must be given consideration, and within the sphere of my observation, the directional overcurrent relay for phase protection ranks lowest in incidence of incorrect connection.

Without discussing the relative merits of the several angular relations of current and voltage, one example of the several possibilities of the directional overcurrent phase relay will be treated briefly. The several choices have one common characteristic, that is all are so connected that the current leads the voltage at unity power factor. Fig. 21 shows the connections that most nearly resemble those of the two element wattmeter.

Each single phase relay has the same current-voltage relations as one of the elements of the two element wattmeter; that is the current leads the voltage by thirty degrees at unity power factor. The same considerations as to voltage notations and current voltage relations apply. In view of this relay's record for good treatment in the matter of connections, it will now be dropped from discussion in favor of some that have not fared so well.

Potential polarized ground relays

Referring to the aforementioned sphere of observation, the relay that ranks highest in incidence of incorrect connection is the potential polarized ground relay. It has been known to have received rough treatment, in this respect, in construction drawings, publications, and actual installations, by most of the representative groups in the business.

The reason for this, in the case of a rather uncomplicated appearing setup, probably lies in the fact that those who deal with it sometimes become so polarity mark conscious that they match trans-

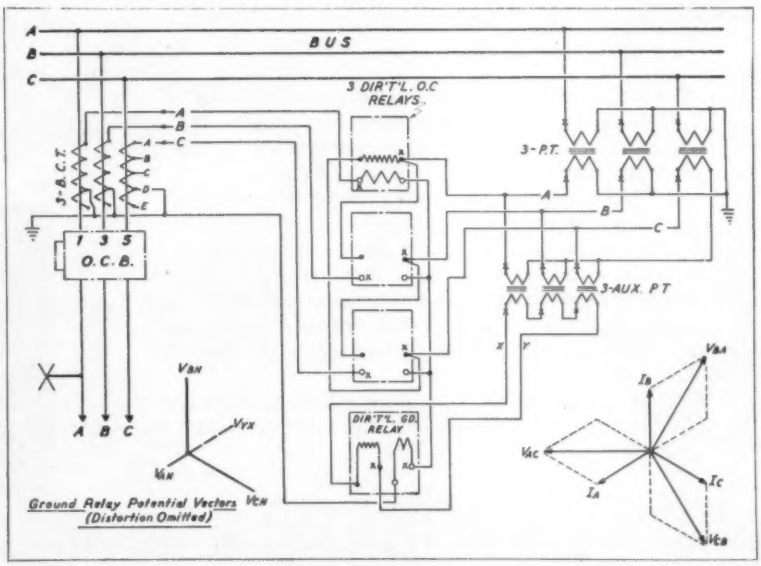

Fig. 21—Directional overcurrent relay connections, phase and ground.

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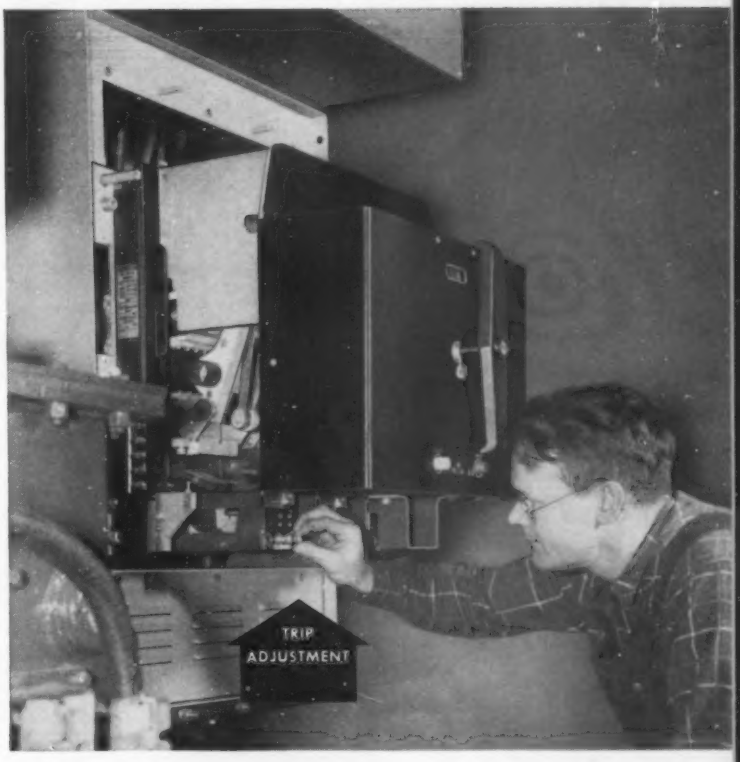

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former polarity marks with paired relay terminals without stopping to consider the true nature of the case.

As illustrated in Fig. 21, the voltage corresponding to the transformer on the faulted phase is the voltage that would, under normal conditions, offset the sum of the other two and thus make the total sum zero; but this voltage has disappeared or greatly diminished; consequently the voltage at the relay terminals is in the opposite direction to that which would normally be supplied by the transformer "A" and the relay must be connected accordingly.

In the vector diagram, the dotted line, opposite in direction to the vector representing the faulted phase, indicates the voltage applied to the relay coil.

Differential relays

In order to distinguish between setups not involving a phase shift and those that do, the term "bus differential" will be used to designate a zone containing only buses and breakers (ignoring potential transformers) while "transformer differential" will designate any zone containing a power transformer. Generator differential will not be taken up since it does not involve connections essentially different from the usual bus differential scheme.

The differential method of protection depends for its operation upon the difference between the total current input to and the total current output from the protected section or "zone." The zone may consist of a bus and the breakers connected to it, or one or more pieces of equipment or a combination of these. An appreciable difference between total input and total output current exists only when a fault occurs within the zone. As a consequence, differential protection will not act as backup protection for faults beyond its zone no matter how great the magnitude of the fault. To do so would be operation on a "through" fault which is an incorrect operation for a differential scheme.

In order to have relays check the difference between total input and total output a set of current transformers is required for every connection to the zone, except small equipment, as potential transformers, which have an inappreciable effect.

Bus protection

A simple example of differential relaying is a set of overcurrent relays connected differentially to protect a bus, as shown by Fig. 22. Here the coils of the overcurrent relays are connected between phase wires and neutral of the required sets of current transformers. Except in the case of internal faults, the total current input through the supply breakers is equal to the total current output through the feeder breakers. The secondary currents circulate through the current transformers.

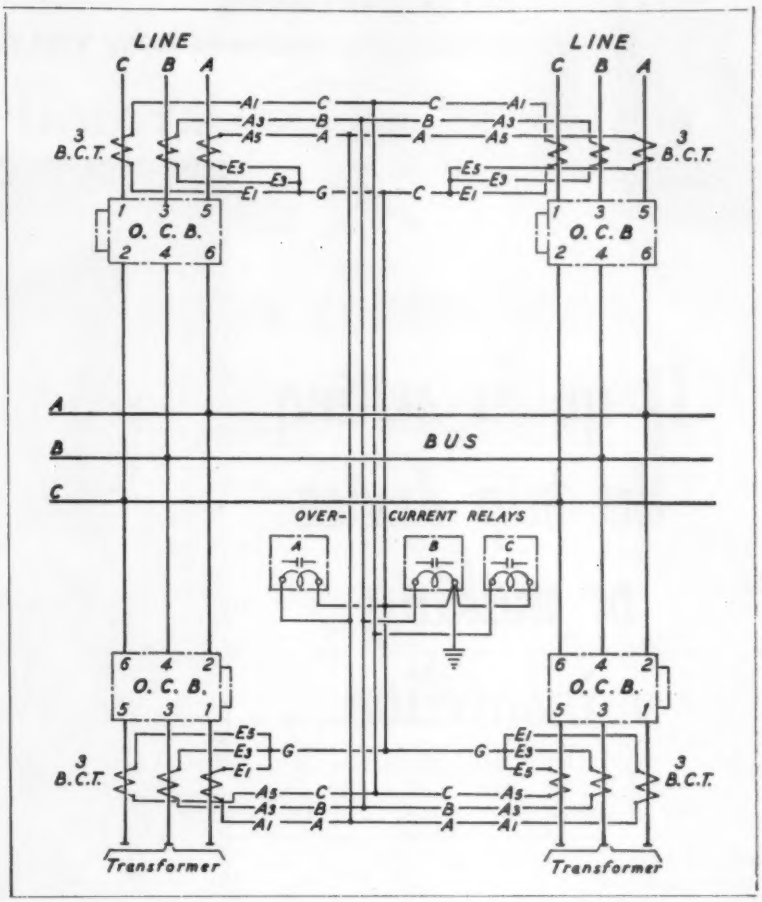


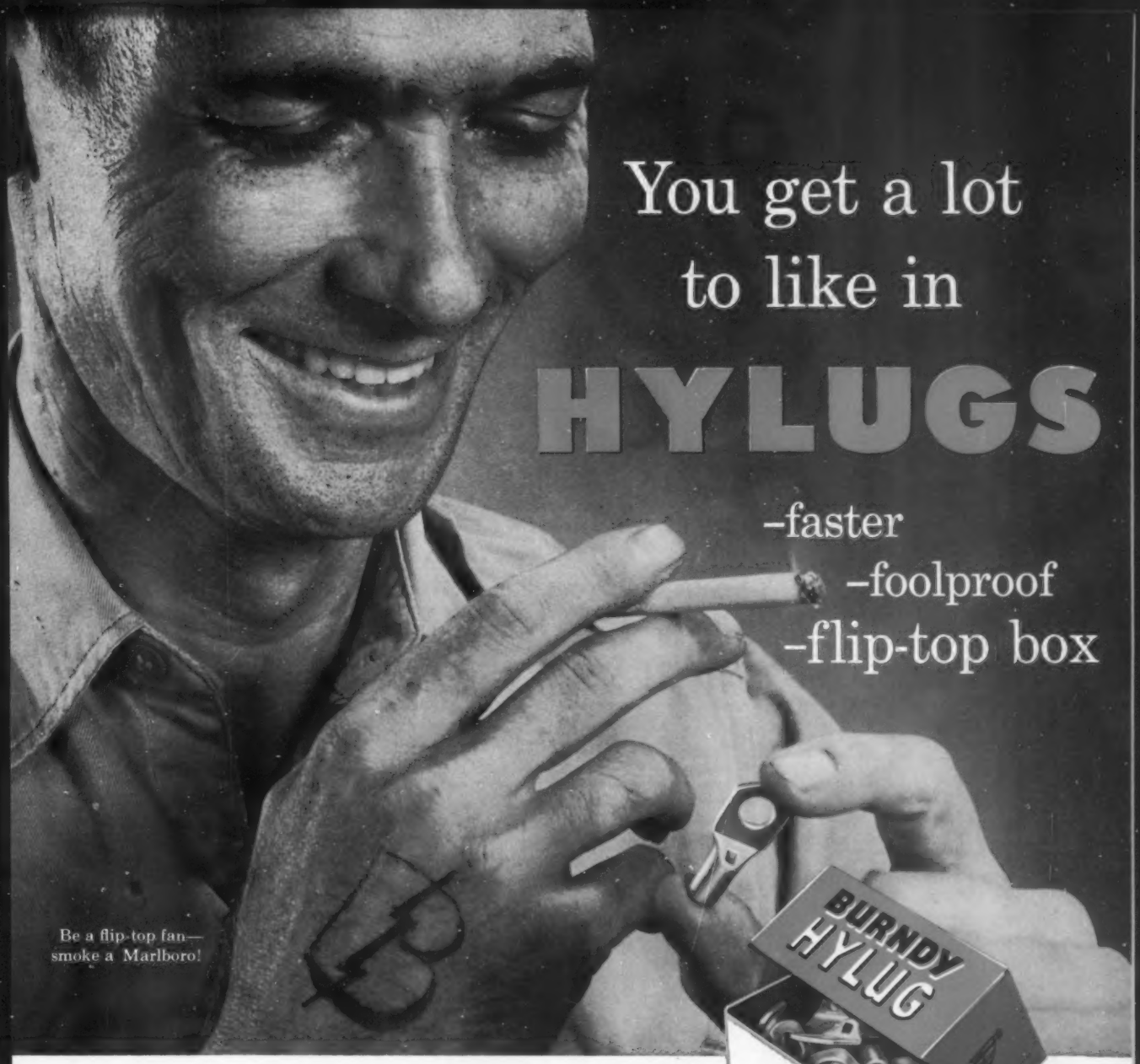
Fig. 22—Overcurrent relays connected for bus differential protection.

Any current through the relay coils is due to C.T. differences, circuit differences, or degree of saturation, which is hoped to be too small for relay operation even on heavy external faults. The position of each coil in the circuit corresponds to that of the operating coil of a regular differential relay. Consequently the current settings of the relays must provide the tolerance necessary when a feeder becomes faulted outside the zone, for its current transformers cannot be expected to quite balance the input from the supply breaker current transformers.

In the case of an internal fault there can be very little output from the zone and the difference flows through the relay coils. Methods of arriving at the correct connections for producing the desired results will be considered along with relays having both operating and restraint coils.

For the setup shown in Fig. 23, with its small number of bus connections, the current restraint relay is frequently used instead of relays made especially for bus protection. Two conditions must exist before it can operate. First an appreciable current must flow through its operating coil. Second, there must be a minimum percentage difference between the currents in the two restraint coils.

In making connections, the main point to consider is the relative direction of current in the secondaries of current transformers in



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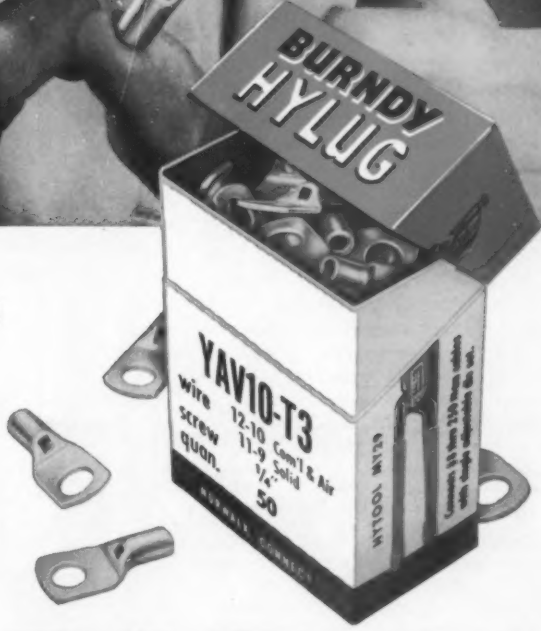

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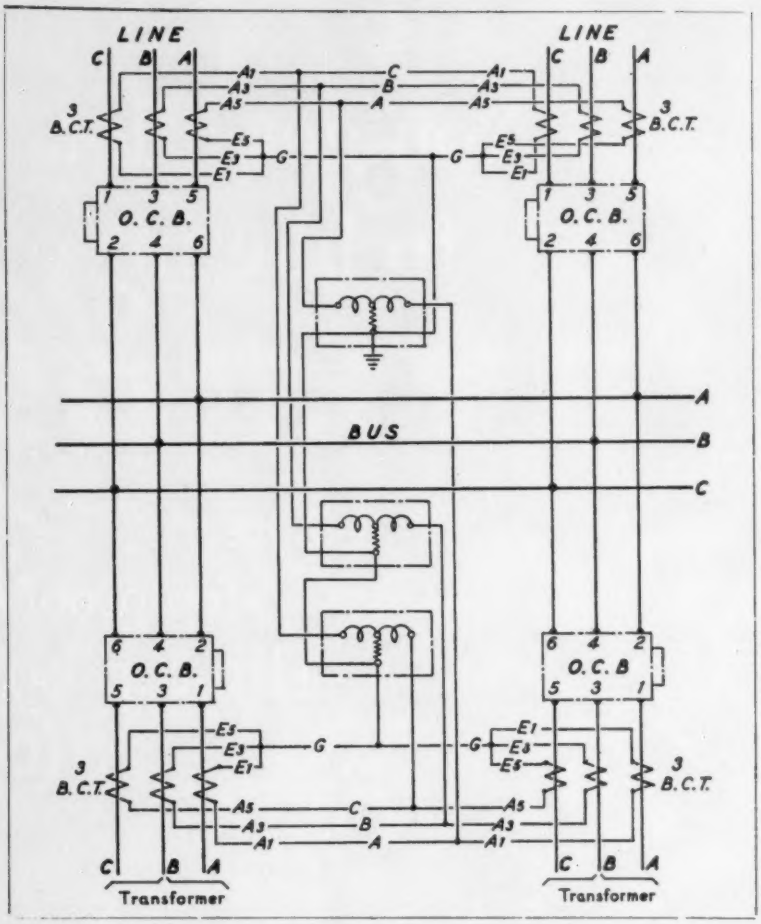

Fig. 23—Percentage differential relays used for bus protection.

the incoming and outgoing ties. The point of view suggested here is that all be considered incoming, as for an internal fault, and that C.T. leads be selected for parallel connection under this condition. The problem becomes simpler if only two ties are considered at a time, as one transformer breaker and one line breaker of Fig. 23. If their C.T. secondaries are in parallel with both supplying power to the bus, they will be in series when one is putting in and the other is putting out. Then the others can be connected in parallel with these on each side of the relays.

Transformer protection

Fig. 24 shows a scheme of transformer protection. In making current transformer connections for differential protection of a three-phase transformer (or a bank of three single-phase transformers) two differences must be taken into account. (1) The high and low side currents are different. (2) There is a thirty degree phase shift between the high and low sides of the transformer if one side is delta and the other wye as in the usual case.

Adjustment is made for the first by a selection of current transformer ratios that results in secondary currents of the same value, or within prescribed limits, at the relays. As already noted the preferred status is to have the current transformer secondaries on each side of the relay equal. Since this is not always feasible, differential relays are provided with current taps so that ampere turns can be matched in the case of a disparity between high side and low side currents. However, all current transformers that are connected in parallel on the same side of a differential relay must have the same overall ratio.

For clarity this discourse will proceed on the basis that the sum of the currents on each side of the relays must be equal. In determining the C.T. ratios one need only be concerned, at first, with one breaker on each side of the transformer. In this ratio compensation he must watch for delta C.T. connections. A delta connection of current transformers divides the nominal ratio by $\sqrt{3}$; therefore, the ratio used must be the wye ratio multiplied by this factor.

Adjustment is made for power transformer phase displacement by connecting the current transformer secondaries in delta on the wye connected side of the power transformer as illustrated in Fig. 24. The delta must be made up in such

(Continued on page 123)

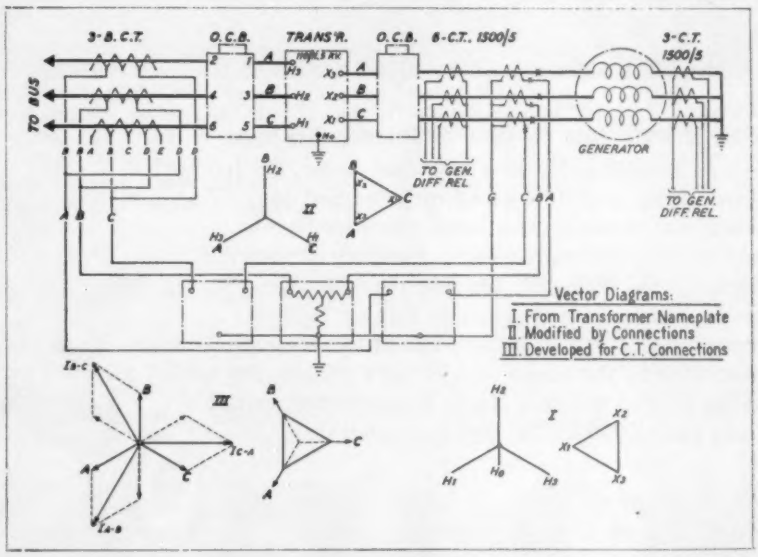

Fig. 24—Differential relay protection scheme for transformer bank.

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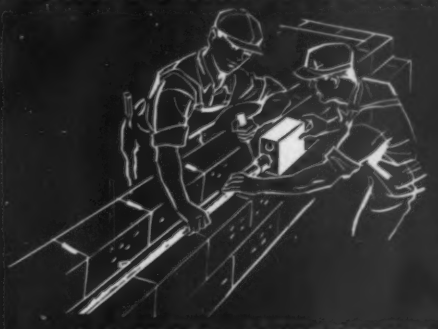

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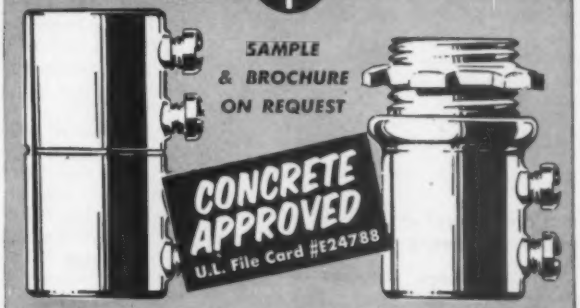

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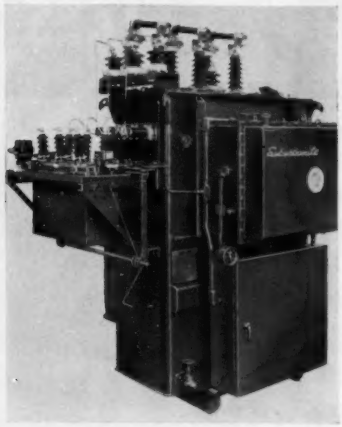
Notes on new utility equipment

Low-cost unit substation for rural and industry use

PENNSYLVANIA TRANSFORMER Division, McGraw-Edison Co., Box 330, Canonsburg, Pa., has announced development of a new, low-cost substation, specifically designed for rural areas, small towns, and outlying industrial plants. The suburbanite is a completely integrated substation, said to offer savings as high as 25% in initial cost, compared with other types.

The substation utilizes an automatic recloser rather than an oil or air circuit breaker. Other equipment includes metering devices, load tap changing equipment in the low voltage, high and low voltage arresters, and high voltage fuses. The company



reports that the unit ordinarily is used with pole-mounted disconnect switches, thus providing a complete substation with a minimum of installed equipment.

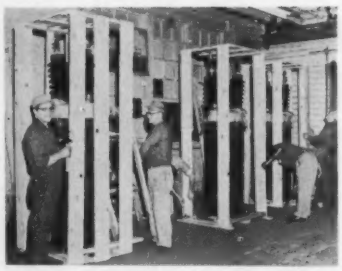
Although generally recommended for applications through 2500 kva, it may be used for larger ratings within the capacity of reclosers. High voltages range from 15 through 69 kv, and low voltages from 2.4 through 15 kv. Either one or two circuits may be provided.

For additional data, ask for item U-335, using the coupon on page 106.

46 kv automatic circuit reclosers

I-T-E CIRCUIT Breaker Co., of Greensburg, Pa., has announced availability of their new 46 kv automatic circuit recloser, Type HVR, with self contained reclosing mechanism.

These reclosers are rated at 140-amperes, at 46 kv, and can also be supplied for 34.5 kv rating. In addition to the 140-amperes reclosers shown, other ratings are available for 200, 280 and 400-amperes.



This two-cycle instantaneous tripping recloser has interrupting ratings of 4000-amperes, rms. symmetrical for 34.5 kv; and 3000-amperes rms. symmetrical, for 46 kv.

For additional data, ask for item U-336, using the coupon on page 106.

Non-corrosive aluminum body on transmission strain clamp

AN IMPROVED aluminum transmission strain clamp, type SD, has been developed by Anderson Electric Corporation, 700 North 44th St., Birmingham, Ala.

This clamp features a non-corrosive aluminum body and keepers eliminating the need for ribbon or liners. This advanced design for high holding power features a flared mouth at the cable entrance which protects the conductor against chafing. The clamp is stronger than conductors or insulators with which it is used, and is supplied with clevis or socket eye fittings.

This clamp permits continuous conductor, eliminating troublesome jumper connections as in the case of compression dead ends. Many sizes are available allowing selection of clamp with groove diameter approaching conductor diameter. Stainless steel cotter key prevents electrolytic corrosion with clamp adjacent to cotter bolt.

The bolts, nuts, lockwashers and clevis pin are hot dipped galvanized steel. A large sagging eye is featured for use of coffin hoists. The clevis and socket eyes are galvanized, heat-treated maleable iron, meeting NEMA Standards.

An exclusive nose extension permits stable seating of nose of clamp at cable entrance into hot line strain carriers for ease of maintenance of strain insulator strings.

The clamp has complete quality control from ingot to finished product, backed by thirty years of Anderson research and development in the manufacture of aluminum products. It is available through insulator manufacturers only.

Strength and holding power of the clamp had been thoroughly tested on Anderson's horizontal testing machine, one of the few machines of this type in the United States. The test machine has a 50,000 lb. capacity and is capable of testing clamps assembled with 5-foot to 50-foot conductor lengths.

For additional data, ask for item U-337, using the coupon on page 106.

Galvanized steel cable fittings and accessories

A FULL and extensive line of galvanized steel cable fittings and accessories has been added to the line of cable supporting systems and equipment manufactured by T. J. Cope Division of Rome Cable Corp., Third and Walnut Sts., Collegeville, Pa.

Cope cable ladder comprises a system of interconnecting steel parts and associated fittings readily installed for the support of interlocked armored cable. The basic straight section unit of Cope cable ladder consists of parallel stringers of "z" section steel with slotted rungs at specified intervals for securing the cables.

Spacing of the rungs provides ample support for the simi-rigid cables and facilitates the rerouting of individual or branch runs. Drop outs for cables can be improvised between rungs, thus eliminating the need for field cutting or otherwise making special openings in the ladder installation.

Ladder straight sections are available in 12' lengths and a variety of widths. Rungs are spaced from 6" to 18" intervals to meet specific cable requirements. A complete line of fittings and accessories is available for making changes in direction and/or elevation. Cope cable ladder can be

readily inter-connected with Cope cable trough systems by means of an easy-to-use pin-type coupling device.

For additional data, ask for item U-338, using the coupon on page 106.

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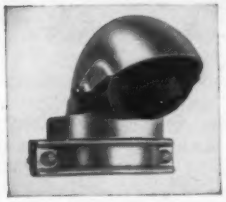

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Redesigned tap changer body eliminates tank entry need

A REDESIGNED, repositioned externally-operated tap changer, said to eliminate any need for entering the tank, has been announced by the R T & E Corp., Waukesha, Wis.

The new tap changer body is molded in one piece, multi-skirted for long creepage and high surge strength. The material is electrical grade, wood flour-filled phenolic of

high thermal stability. Contact is made through a bridging roller, under spring pressure. The roller is specially grooved around its periphery to give double contact surface for low resistance and cool operation.

The switch is operated by removing the screw-on-type cap, reversing it, and using it as the handle. An unique feature of this handle is the keying action between the handle and multi-slotted ring around the shaft. This action makes it necessary that the switch be positively in tap position before the handle can be removed.

For additional data, ask for item U-339, using the coupon on page 106.

Quadrant strain clamp design for lower stringing tensions

THE COOLINE L-W series of aluminum quadrant clamps has been recently made available from the Ohio Brass Co., 380 N. Main St., Mansfield, Ohio. These new clamps are especially designed for use under the lower stringing tensions employed in distribution and station deadends.

They are lighter in weight, faster to install and lower in cost than

O-B's standard line of Cooline clamps designed for transmission lines. This six-clamp series provides adequate holding power for aluminum conductors ranging from .2 to 1.3 inches in diameter.

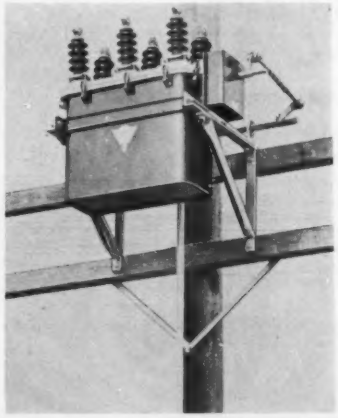
Because the need for cutting or splicing conductors is eliminated, the Cooline L-W series lends itself to convenient deadend jumper loops. Gentle snubbing action makes the Cooline L-W suitable for all-aluminum and AAAC conductors, as well as ACSR.

Of the six Cooline L-W clamp sizes, five sizes have two ½-inch U-bolts and accept conductors ranging from .2 to 1 inch in diameter. These five clamps have ultimate strengths ranging from 7,000 to 18,000 pounds. The sixth clamp of the series has three ⅝-inch U-bolts, is made for conductors of .75 to 1.3-inch diameters, and has an ultimate strength of 25,000 pounds.

For additional data, ask for item U-340, using the coupon on page 106.

Oil switches for low power factor loads

SWITCHES especially designed to operate at low power factors augment the line of three-phase, outdoor, Type V switches manufactured by Line Material Industries, McGraw Edison



Co., Milwaukee 1, Wis. Rated at 15 kv, 400 amperes, and 110 kv BIL, the new switches offer dependable low cost switching for sectionalizing and load-break applications on highly inductive loads.

Applicable to systems with phase-to-phase ratings of 14.4 kv and below, the switches are designated VLH, VLR, and VLM. VLH models are hook-stick operated, VLR models are motor-operated, and VLM models have a manual-remote handle.

The VL series of switches interrupt 400 amperes of lagging current at all power factors between 10 and 100 per cent. Bayonet-type contacts are designed to assure a long, trouble-free life. Momentary latching ratings are 20000 amperes asymmetrical, and the four-second rating is 6000 amperes symmetrical.

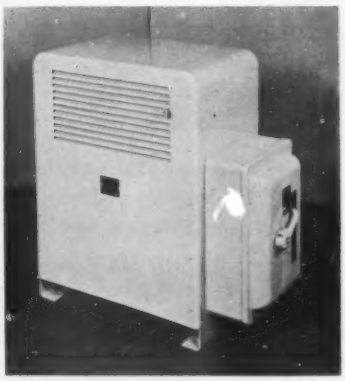
Available accesories for L-M Type V oil switches include mounting assemblies for poles or substations, heating elements, low-voltage signal arresters, and auxiliary switches.

For additional data, ask for item U-341, using the coupon on page 106.

Distribution transformers with side-mounted breakers

DRY-TYPE distribution transformers with wall-mounted breakers for 300 kva ratings and below are now available from the Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

The breaker is mounted on the side of the transformer and is connected internally to the high-voltage wind-



ing, making an integral package. This eliminates conduit run and condulet fittings associated with remote mounting of the breakers.

The transformer protection is directly connected to the transformer, insuring proper coordination. Since the breaker is attached to the associated transformer, positive assurance is provided to maintenance personnel that incoming service is disconnected. Primary connections are compactly arranged between breaker and transformer terminals with complete accessibility to the low-voltage terminals.

For additional data, ask for item U-342, using the coupon on page 106.

FROM CARTON TO ATTIC...

Installed in Minutes!

BAR-BROOK* *BREEZE* BUILDER*

Package Unit

ATTIC FANS

. . . are true package units — NOT partially pre-assembled.

Fan, motor, ceiling shutter and suction box are completely factory assembled, and wired to standard knock-out box on top of fan. Pre-cut ceiling trim. The builder's answer to economical home cooling. 3 sizes for 31", 36", 42" ceiling openings. UL Approved, Certified Ratings.

Certified Ratings — AMCA

WRITE FOR CATALOG of entire BAR-BROOK line of large fans and shutters.

Also Model FH Fans, for vertical or horizontal operation. 6 sizes, 30" to 54".

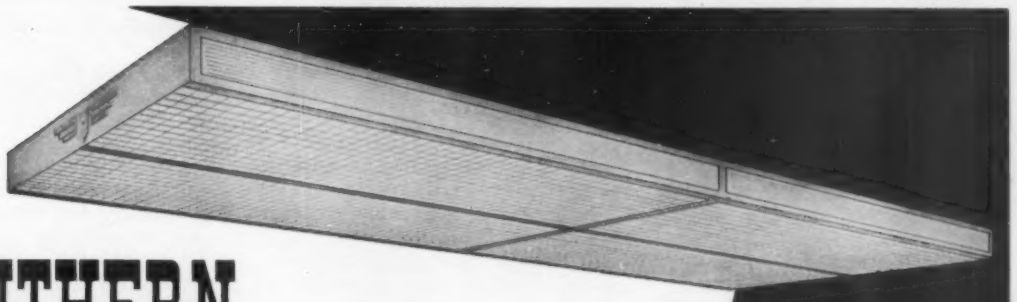
UL

BAR-BROOK MFG. CO., INC.

Box 6638-F — Shreveport, Louisiana

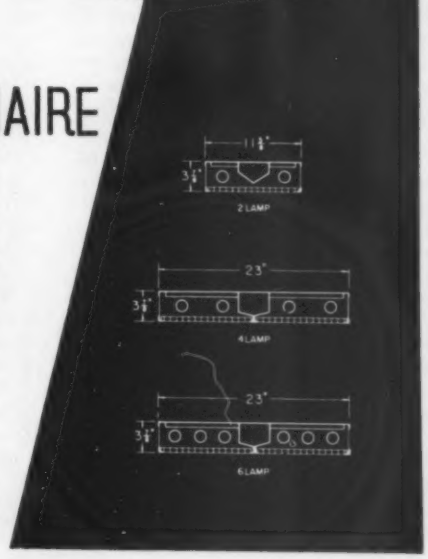
Fan Makers Since 1932

*T. M. Reg. US. Pat. Off.



SOUTHERN

SHAL-O-LITE LUMINAIRE



This shallow luminaire may be used as an individual unit, in continuous rows, or arranged in various patterns. When surface mounted, the plastic side panels of ribbed, polished diffusing polystyrene illuminate the adjacent ceiling. The white translucent louver of molded ⅝" cubicles provides 42-degree shielding lengthwise and crosswise.

Available in two, four, or six lamp luminaries with Rapid start, Slimline, or starter type ballasts.

Remember, specify and satisfy with SOUTHERN fluorescent fixtures.

SOUTHERN LIGHTING MFG. CO.

502 ELWELL ST. — **ORLANDO, FLORIDA**

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ LAST MONTH we promised a more complete discussion in this issue of the principle involved in the problem on interrupting capacity which was stated and sketched last month but only briefly answered. We will now proceed with the promised discussion. We also stated last month that while Code rules could be clarified, they did not lend themselves readily in every instance to simplification. That statement applies only to the rules themselves, not to underlying principles. The latter can be simplified, and we think it prudent to do so now in our discussion on interrupting capacity.

Interrupting capacity

The interrupting capacity of a current interrupting device must be great enough to open the maximum current which can flow as a result of a short-circuit occurring at the load terminals of the device.

The magnitude of this current is directly related to and is approximately equal to the capacity of the power system. The greater the distance from this source, of course, the greater the impedance and, hence, the smaller the current.

However, the larger the power source, the greater the current. A fuse or breaker with a much larger interrupting capacity, therefore, would be required to interrupt the short-circuit current of a 750 kva transformer bank than would be required to interrupt that of a 75 kva bank.

The size of the load has little to do with short-circuit currents. The magnitude of short-circuit current is determined by the secondary voltage rating and reactance of the transformers, the reactance of the generator and the supply conductors from the generators to the transformers, and the reactance of the circuit between the transformers and the fault.

To point up the difference between load currents and short-circuit currents, engineers have likened load currents to the flow of water from a lake through a water conduit. Here, as they point out, the amount of water is directly proportional to the size of the water conduit and of the opening in the valve, or inversely to the amount of resistance to its flow offered by the restrictions of the piping and valve.

Similarly, a greater load current would flow through the element of a 1500-watt lamp and a pair of #10 wires than would flow through the higher resistance of a 10-watt lamp supplied by much smaller wires.

In contrast to this analogy of load currents, the engineers have likened short-circuit current to the

(Continued on page 84)

Code test questions

(1) Branch circuits supplying manual switchboards and switching frames in telephone exchanges shall be computed on the basis of 1½ amperes per unit. True or false?

(2) Because of permissible demand factors, branch circuit conductors are not required to have a current carrying capacity as great as the rating of the branch circuit. True or false?

(3) Branch circuit conductors are required to have a carrying capacity of not less than the maximum load to be served. True or false?

(4) The minimum size of a branch circuit conductor shall be not smaller than #12 if stranded. True or false?

(5) Tap conductors supplying an infra-red lamp heating appliance shall have a rating of not less than 20 amperes when supplied by a 50-ampere circuit. True or false?

(6) Tap conductors supplying individual lampholders or fixtures on 15- 20- or 30-ampere branch circuits shall:

(a) be not smaller than #14.

(b) have a rating not less than 15 amperes.

(c) be not smaller than #18 if not over 18 inches long.

Which is correct: a? b? c?

(7) The rating of the branch circuit overcurrent device supplying a single appliance of 10-ampere or more rating shall not exceed:

(a) 125% of the rating of the appliance.

(b) 80% of the rating of the appliance.

(c) 150% of the rating of the appliance.

Which is correct: a? b? c?

(8) Lampholders shall have a rating of not less than:

(a) 1½ amperes.

(b) 5 amperes.

(c) the load to be served.

Which is correct: a? b? c?

(9) When connected to 15-ampere circuits supplying two or more outlets, receptacles shall have a rating of:

(a) not over 15 amperes.

(b) not less than 15 amperes.

(c) not less than 20 amperes.

Which is correct: a? b? c?

(10) Where in normal operation the load will continue for long periods of time, the load of a branch circuit:

(a) shall not exceed 80% of the branch circuit rating.

(b) shall be not less than 125% of the branch circuit rating.

(c) shall be not less than 150% of the branch circuit rating.

Which is correct: a? b? c?

Correct answers to these questions will be found at the end of this article.

No. 3 in a series

Right off the Wire

A new system using multiple cathodes is said to double the life of the vapor lamps used on highways.

&

A thermionic converter has been made that produces electricity directly from heat with an efficiency of eight per cent.

&

Studies of the northern lights being made with a high-powered, long-range radar may disclose a method of defense against missiles coming over the arctic.

&

Submarine cable can be made in any length at the Simplex Submarine Cable Division's dockside plant. Single lengths are limited only by the capacity of a cable ship's hold, or the length of a train of gondola cars.

&

An electronic system of bank record keeping handles random-sized, unpunched paper checks at the rate of 1800 checks per hour to 40,000 accounts.

&

The world's largest solar furnace is being designed for installation in New Mexico. It will produce temperatures as high as 8,000°F.

&

Elimination of thermal noise by operating microwave amplifiers at the temperature of liquid helium has been found to greatly increase the range of radar.

&

An electronic map plotter is expected to make possible more accurate and cheaper maps from aerial photographs and to lend itself to the automation of mapping.

&

Plans are being made to mount telescopes on balloons in order to make observations above the interference of the earth's atmosphere.

&

The U. S. Air Force has patented an infrared television camera for use at night or in fog.

A new chemical plant will need no outside source of fuel after operation has begun. All the heat required will come from the process.

&

It has been found that one area of the human brain contains a record of every detail of the person's experience. Total recall can be produced by the stimulation of a minute electrical pulse.

&

Phosphors applied to textiles, sheet materials or metal mesh light up when a current is passed through them thus making draperies, for example, sources of illumination.

&

A new microscope for the study of living tissues uses bursts of ultraviolet light too brief (one thousandth of a second) to injure the tissue. The image appears in color on a television screen.

&

A new drug promises to save the lives of many persons who might otherwise die from lethal doses of radiation. It has been tried only on laboratory animals.

&

A form of fiber glass containing uranium 235 has been developed as a fuel for atomic furnaces.

&

A new amplifier is expected to extend the range of radio telescopes about ten times, enough to equal the best optical instruments.

&

A giant air mattress, equipped with arresting and launching gear, has been patented for use as a portable airstrip. On it planes could make belly landings without damage.

&

Tellurium lead cable sheath has excellent vibration, creep and age-hardening resistance, and greater flex life and tensile strength than other lead alloys, say Simplex scientists after exhaustive tests.

A new meter for oil pipelines will measure a flow of 10,000 barrels per hour (four times the capacity of present equipment) with an accuracy of one tenth of one per cent.

&

Simplex C-L-X (Sealex) metallic sheath is manufactured with thermoplastic covering in colors for voltage or general industrial coding.

&

A device called an "electronic sentry" guards against fire, abnormal pressure, high or low water levels, temperature changes and other hazards. It calls a designated person by telephone and gives a pre-recorded message.

"Tree" of Knowledge

This strange looking growth tells an important story to the expert eyes of Simplex scientists. It's a Simplex photomicrograph showing "treeing" effect that results when a 15 KV polyethylene-insulated cable is broken down by 100,000 volts. This is typical of the continuing research work done at Simplex.

If you are interested in the important facts that Simplex scientists Kitchin and Pratt have discovered on polyethylene treeing, write for their AIEE Paper No. 58-121.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

flow of water from the lake in the event the dam itself is demolished. The flow of water, in this case, is dependent on the size of the lake. In a similar fashion, short-circuit current has a definite relation to the size of the supply system.

And there, in simplified form, you have the reason for section 1109 of the Code. Before you install the next set of six 15-ampere circuit breakers with interrupting capacity rated at 5000 amperes as the service for the little hat shop in the down-town network, it might be well to look behind the "dam" to see what size "lake" hovers there!

Now to continue where we left off in our discussion on branch

(Continued on page 125)

Questions on the Code

QUESTION: Under what conditions may branch circuit conductors be run through fluorescent fixtures, and what type of insulation is required on such conductors?

ANSWER: The first part of this question is governed by section 4150, and the second part by sections 4143 and 3102. With one exception, section 4150 forbids the use of fixtures as raceways unless the fixtures themselves are approved as raceways. Those so approved are labeled under the classification of fixtures by the Underwriters' Laboratories, Inc., as "Fixtures Suitable for Use as Raceways."

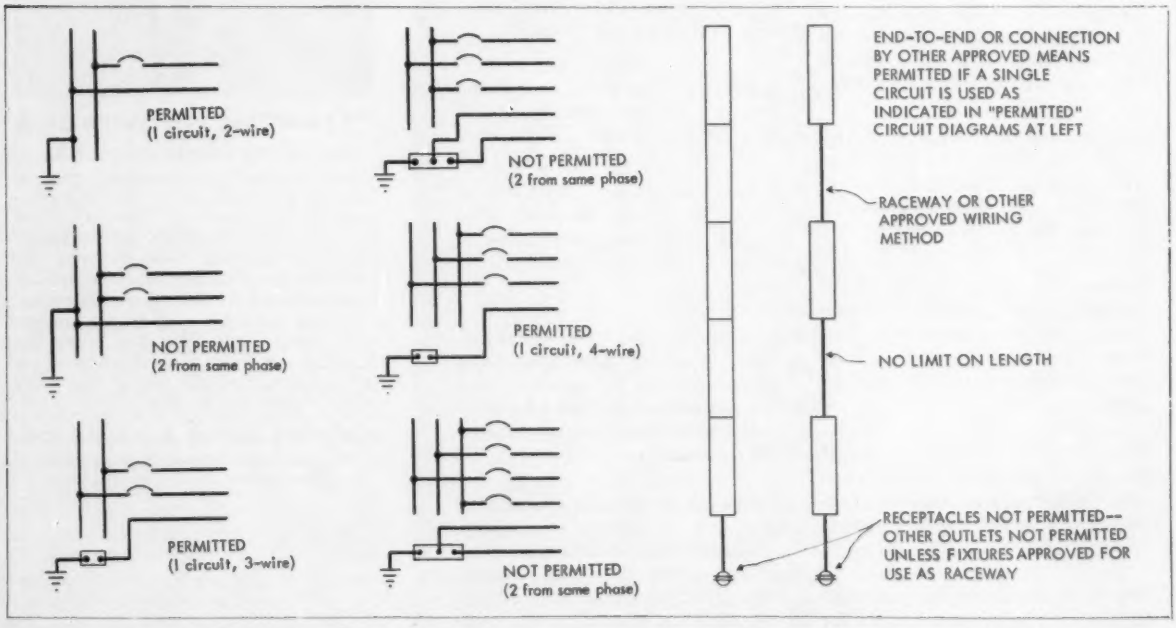
Unless fixtures are so approved, they are not permitted to be used as raceways except for the branch circuit conductors supplying the fixtures, and this is restricted to a single branch circuit.

The term "single branch circuit" permits the use of a multi-wire circuit, but does not permit more than one of any type, regardless of whether it is two- three- or four-wire. And the term "supplying the fixtures" restricts the circuit for that purpose only and does not permit additional outlets, such as receptacles, to be connected to branch circuits which are run through the fixtures. The accompanying diagrams will help to clarify the conditions.

The "single circuit supplying the fixtures" may be carried through fixtures which are connected by approved raceways, by armored cable, by non-metallic sheathed cable, or by any other wiring method approved by the Code as well as through fixtures approved for end-to-end assemblies.

A good many inspectors have raised their Fahrenheit readings to a point considerably above the normal 98.6 degrees while discussing this provision of the Code and would prefer limiting this exception to end-to-end assemblies only or to those connected by "short" nipples or sections of raceway. Most Code authorities agree, however, that the greatest hazard is to that part of the branch circuit insulation which is enclosed inside of the fixture, and that the type of wiring between fixtures is relatively unimportant; that is, any type wiring method which would be approved for the location should be suitable also for this condition.

The second part of this question, regarding the type of insulation, is required by section 4143 to be "suitable for the current, voltage, and temperature to which the conductors would be subjected." Reference is made in this section to the table of temperature and voltage limitation in section 3102. Since conductors carried through fluorescent fixtures are subjected to ballast temperatures, conductors approved for not less than 75 degrees C should be used, such as Type RH. In many cases, of course, conductors approved for higher temperatures would be required.


PERMITTED
(1 circuit, 2-wire)
NOT PERMITTED
(2 from same phase)
NOT PERMITTED
(2 from same phase)
PERMITTED
(1 circuit, 4-wire)
PERMITTED
(1 circuit, 3-wire)
NOT PERMITTED
(2 from same phase)
END-TO-END OR CONNECTION BY OTHER APPROVED MEANS PERMITTED IF A SINGLE CIRCUIT IS USED AS INDICATED IN "PERMITTED" CIRCUIT DIAGRAMS AT LEFT
RACEWAY OR OTHER APPROVED WIRING METHOD
NO LIMIT ON LENGTH
RECEPTACLES NOT PERMITTED--OTHER OUTLETS NOT PERMITTED UNLESS FIXTURES APPROVED FOR USE AS RACEWAY

Unless fluorescent lighting fixtures are approved for use as raceways, only a single branch circuit, supplying the fixtures, may be carried through them. This may be a multi-wire circuit.

Contractors tell how

Some ingenious solutions to wire conduit problems

By E. Rembert DuBose
President
White Electrical Construction Co.
Atlanta, Ga.

◆ OUR RECENT solution of two conduit problems is now tangibly paying off, and there's no reason why it can't do likewise for other contractors.

Pulling of wire through large conduit with elbow fittings has long been a source of headaches. Lubrication ordinarily applied to wire at the entrance box invariably has worn off by the time that the wire has reached the initial elbow, and from that point trouble consistently has ensued.

We have now licked the trouble by drilling a small hole in each elbow fitting, prior to installation, and plugging it with an Alemite automotive lubrication fitting. Applying an ordinary compression grease gun to the lube fitting, we then shoot the elbow full of Ideal Wire Lube, which stays put throughout the operation and splendidly facilitates the conduit wire-pulling job.

The grease-fitting is impervious to anything not applied with a compression gun and may be safely retained in the elbow for the life of the conduit installation.

Incidentally, for the sake of the record, our company owes a vote of thanks to Regional Engineer Ernest Range, of The Okonite Company, for giving us the idea.

Our foreman, John Cooper, recently came up with an ingenious way to prevent splitting of transite ductline couplings which, during a certain job, heckled us no end.

Essentially, our objective on this particular job was to achieve an extensive, gradual curve in a five-inch underground composition ductline, progress on which lagged discouragingly due to tendency of the couplings to split during the installation.

At this point, Cooper came up with a supply of baling wire which he proceeded to wind tightly twice around each affected coupling, prior to installation. Results were immediate and gratifying, in that the compression exerted on the couplings by the baling wire proved sufficiently adequate to off-set, during bending process, the opposing pressure from within. Thus, further splitting of couplings was prevented.

In a simple automotive lubrication fitting, examined above by President E. Rembert DuBose of Atlanta's White Electrical Construction Company, lay successful solution to the knotty problem of pulling wire through large conduit with elbow fittings.

Contractors need credit committee

By Gerson Maisel
Maisel Electric Co.
Washington, D. C.

◆ A CREDIT CLEARANCE house organized by an unbiased source would be of great value to contractors. By an unbiased source I have in mind National Electrical Contractors Association or the local utility company.

Electrical contractors have been the victims of skippers, those who engage them to carry out jobs on which payment is held up indefinitely. During this period of pursuit and even litigation the

Ask your

Westinghouse representative

about the exclusive benefits

you get from

URL and URF REGULATORS...

WITH ALL THREE FEATURES

FOR CLOSER REGULATION

Westinghouse URL and URF regulators — with the complete combination of 1¼% step voltage regulation, inverse time delay relay and the instant-response tap changer — hold set voltages with *only ⅛ to ½ the voltage error of any other regulator.*

This means that you can carry greater loads and produce more revenue . . . because:

- The narrower effective bandwidth allows lines to be stretched further — without additional regulators.
- Reduced voltage error permits existing lines to be loaded heavier — without the expense of additional lines.
- Corrective operations are reduced by 42%, contact erosion cut 15% — substantial savings in maintenance.

Call your Westinghouse representative for the complete story of the benefits of better regulation . . . made possible by PLOWBACK OF EARNINGS into further investigations of the electric utilities' problems of electrical distribution. J-70858

YOU CAN BE SURE...IF IT'S Westinghouse

builder or speculator may call upon another contractor engaging him on an electrical job, and the same experience repeats itself. A repetition of such cases makes no one the wiser except the contractor who has already been "taken."

If a contractor did not get paid, it means that every contractor has difficulty ahead of him. It is just a matter of time before he will be victimized.

A credit committee set up by NECA, comprised of members other than contractors, would receive reports of skippers and deadbeats and record them. Then when a new customer called a contractor, he could check credit first before taking on the job. The experience of one contractor should be disclosed to others. By reporting such experience we protect ourselves. We protect our right to a livelihood.

Challenging job is work stimulus

By Walter C. Davis

President
Walter C. Davis & Son Inc.
Alexandria, Virginia

◆ WE ENJOY a job that presents a challenge. Exacting work where precise conditions have to be met,

Electrician wires control panel for George Washington Masonic Temple in Alexandria, Va., an installation handled by Walter C. Davis & Son.

where it is important to get artistic effect precisely right and to the complete satisfaction of someone's concept, is a challenge to a contractor's ingenuity, imagination and skill.

Since 1933 we have been doing all lighting and power wiring for the George Washington Masonic Temple. Of special interest to us was lighting up a 20-foot statue of the country's first president in which light had to be thrown 100 feet from within shadows. We experimented with a number of possibilities working closely with the sculptor to get the dramatic effect he wanted. There were to be no shadows at all on the bronze statue. We arrived at our best results by using seven 500-watt seal beam lights which threw light from the dome-shaped ceiling, a row of concealed flood lamps behind the statue.

We installed, also, an automatic guide system, which synchronizes light and sound as a visitor steps off the elevator of the Temple, and presents a series of lectures on chapter work to the accompaniment of the lighting up of pictures. A push button starts the series of seven steps around the room.

A building service of 1500 amperes, 230 volt, 4-wire, 3 phase was provided, and the temple has remote control panels on each floor, with lighting dimmed by remote control in the first floor lodge rooms.

(Continued on page 124)

WIRING ESTIMATE

HENRY WEST BAUKAT
Electrical Engineer & Contractor

Phone 3062
3048

P. O. Box 625
Venice, Florida

Customers Name _____ Address _____

Contractor _____ Number Outlets: Wood _____ Furred _____ Concrete Block _____

CALCULATION OF TOTAL LOAD	Connected Load	Demand Load
GENERAL LIGHTING LOAD		
_____ Sq. Ft. x 3 Watts ..... = _____ Watts		
SMALL APPLIANCE LOAD — _____ circuits x 1500 watts		
Total		
INDIVIDUAL EQUIPMENT LOAD IN WATTS — First 3000 watts at 100%		
Balance _____ watts at 35%		
( ) Range		
( ) Water Heater ..... _____		
( ) Clothes Washer ..... _____		
( ) Clothes Dryer ..... _____		
( ) Dishwasher ..... _____		
( ) Food Waste Disposer ..... _____		
( ) Attic Fan ..... _____		
( ) Bathroom Heater No. 1 ..... _____		
( ) Bathroom Heater No. 2 ..... _____		
( ) Water Pump ..... _____		
( ) Telephone Circuit ..... _____		
( ) Chimes ..... _____		
( ) _____ _____		
( ) _____ _____		
( ) _____ _____		
( ) _____ _____		
( ) _____ _____		
Total _____ watts at 75%		
CIRCUITS _____ POLES _____		
SERVICE-ENTRANCE LOCATION _____ Total		

SERVICE EQUIPMENT AND SERVICE-ENTRANCE CONDUCTORS
For 115/230 volt, 3 wire system ..... _____ watts ÷ 230 = _____ amp.
Service-Entrance Conductors ..... 3 conductors No. _____
Main Breaker ..... _____ amp. 2 pole

VOLTAGE DROP:

Cir. Mil. $\frac{22 \times \text{\_\_\_\_ amp.} \times \text{\_\_\_\_ ft.}}{2.3}$ = _____ = No. _____ Wire

MSC

DATE _____ Contract Price _____

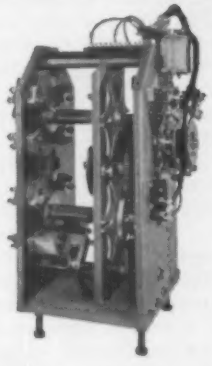
By _____

RESIDENTIAL WIRING ESTIMATES—This concise estimate form has been an important factor in this contractor's profitable operations in the home wiring field. Henry West Baukat, electrical engineer and electrical contractor of Venice, Fla., finds it helpful to have complete information on each job in a single readily available file.

BETTER REGULATION DEMANDS ALL THREE

1¼% step regulation

Inverse time delay relay



Instant-response tap changer

. . . and only Westinghouse has all three. J-70857-R

YOU CAN BE SURE...IF IT'S

Westinghouse

Know the law

by Arthur L. H. Street

Here's how to legalize that mechanic's lien

◆ IN NO STATE does an electrical contractor or dealer have a right to enforce a lien against real estate for work done or materials furnished, unless notice be given in the precise manner required by the statutes of the particular state. Thus, it becomes a matter of vital importance to see that every notice given complies strictly with legal requirements.

Here is a notice that a builders supply company in Arkansas sent to debtors. It was commendably polite as a letter, but was valueless as the basis for enforcing a mechanic's lien:

"Dear Mr. and Mrs. LeGrande: This is to notify you that within ten days after you receive this notice, we will file lien on your property * * * at 500 N. Arkansas in Crossett, Ark., for materials bought and put in this property."

The Arkansas Supreme Court said that such suit to enforce a lien against the property was properly dismissed for three distinct reasons: (1) The notice did not state what sum of money was claimed to be due.

(2) It did not show who owed the bill. (3) It was sent by registered mail, whereas the law required that it be personally served.

Although the court does not mention the fact, it would seem that it would have been safer to have given the legal description of the property, rather than the street address, which itself was defectively stated as "500 N. Arkansas," without designation as a street.

Especially noteworthy is the court declaration: "The mailing of the notice by registered mail * * * is an insufficient compliance with this statute," which requires *personal* service.

We suggest that every electrical contractor and dealer have on hand a supply of printed or multigraphed forms, approved by his local attorney. There should also be kept a sample form, fully executed and approved by the attorney, showing how each blank should be filled out. Though there may be a slight attorney's fee involved, such would be negligible compared to the major loss resulting from failure to preserve a lien which can be enforced. (Scott v. LeGrande, 287 S.W. 2d. 456)

Contractors are warned to retain specifications

◆ AN INTERESTING CASE decided by the Georgia Court of Appeals shows that use of a little ink and paper might have avoided an expensive lawsuit, even if an electrical contractor did "come out on top." (Farr v. McCook, 98 S. E. 2d 584.)

Farr employed Lucas, general contractor, to build a house. The contract called for installation of specified electric wiring and equipment. Lucas accepted Electrical Contractor McCook's bid to do the work for $1,798.

Before the work began, Owner Farr conferred with Lucas and McCook and submitted a new set of electrical specifications. As an experienced electrician, McCook readily discovered that the change would greatly increase the cost over that of the original specifications.

It was agreed that Lucas should "step out of the picture," so far as the electrical work was concerned, and that McCook do the work according to new specifications. Lucas would pay McCook $1,798, the subcontract price, while Farr would pay McCook the difference between his initial bid and the cost of doing the work to new specifications. On completion, the work was found to have been done to specifications at a cost of $4,203.27.

Contractor Lucas paid McCook the agreed $1,798, which left a balance of $2,495.27. On that, Farr paid McCook $200, but refused to pay more. McCook then sued him for the remainder.

The Court of Appeals decided: Farr was not entitled to dismiss the suit on the ground that Lucas was a necessary party thereto. The work agreement under the new specifications constituted a direct contract between owner and electrical contractor, eliminating Lucas to the extent that the cost was increased over the price for the superseded specifications.

Nor was the suit dismissible because McCook's petition to the court did not include a copy of the new specifications. It was sufficient to allege that McCook did not possess a copy of the specifications but that a copy was either possessed by Farr or was available to him.

This suggests the desirability of an electrical contractor's securing and retaining as part of his files a precise copy of any building specifications covering work or materials furnished, to facilitate proof in court, if necessary, that there has been full compliance.

Neon sign failure laid to customer's oversight

◆ A DECISION by the Louisiana Court of Appeal, Second Circuit, specifically involved the question whether failure of a neon sign to function was due to the installer's fault or to the fault of the customer relied: "This sign is guaranvolved would equally apply to other electrical installations.

The contract contained the following clause on which the customer relied:: "This sign is guaranteed for a period of one year from date against mechanical and electrical defects."

In suing for the cost of placing the sign in proper operating condition, the customer insisted that it was the installer's fault that the sign did not light up.

On the other hand, the installer relied upon this clause of the contract: "Customer to furnish electrical outlets and sufficient and ample electricity to properly and adequately burn sign and in event additional loads are put on line after signs are installed company assumes no responsibility as to effective burning or lighting of signs or tubing."

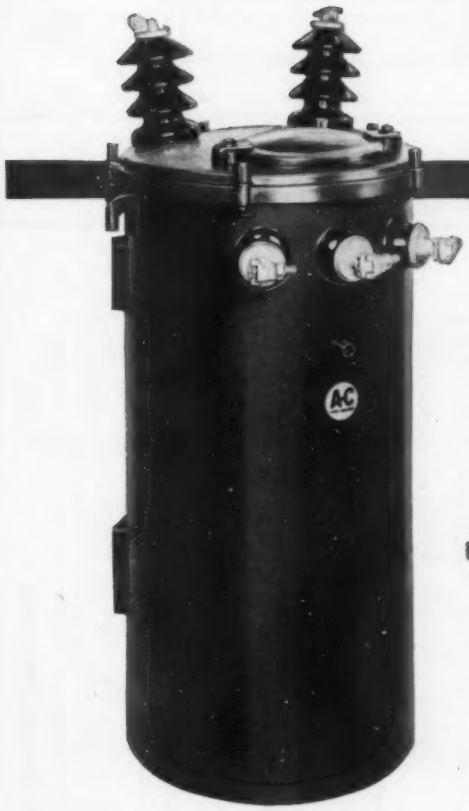
The court decided that the trial judge was warranted, by the evidence produced at the trial, in deciding that the fault lay with the customer in failing to furnish electrical outlets required by the contract. (Hickman v. Fomby, 92 So. 2d 761.)

Craftsmanship at Allis-Chalmers

...includes

Careful Crating

of Distribution Transformers



Advanced engineering and manual skill at Allis-Chalmers extend even to the crating operation. Exhaustive shock tests of crate designs combined with care in manufacture assure safe arrival of shipments . . . protect the outstanding performance and long life built into every Allis-Chalmers distribution transformer. You save time and money in handling costs, as sturdy construction of crates keeps damage to a minimum. Each crate bears the seal of approval by the National Safe Transit Committee.

Pallet base facilitates safe, easy handling

The pallet base of the Allis-Chalmers transformer crate affords the speed, convenience and safety of fork truck stacking . . . promotes maximum utilization of valuable space. Because of its sturdy construction, the crate base may be reused for your own materials handling and storage.

For the complete craftsmanship story, see your Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS A-C

A-5487

New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CONDUIT STRAPS "ONE HOLE"
STEEL MOUNTED
(DRILLING BY POWER)

SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/2"	.2	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75
3/4"	.2	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75
1"	.25	.313	.375	.438	.50	.563	.625	.688	.75	.813	.875	.938
1 1/4"	.3	.375	.450	.525	.60	.675	.75	.825	.90	.975	1.05	1.12
1 1/2"	.3	.375	.450	.525	.60	.675	.75	.825	.90	.975	1.05	1.12
2"	.35	.438	.525	.613	.70	.788	.875	.963	1.05	1.13	1.23	1.31
2 1/2"	.35	.438	.525	.613	.70	.788	.875	.963	1.05	1.13	1.23	1.31
3"	.35	.438	.525	.613	.70	.788	.875	.963	1.05	1.13	1.23	1.31
3 1/2"	.45	.563	.675	.788	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69
4"	.45	.563	.675	.788	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69
5"	.5	.625	.75	.875	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88
		"TWO HOLE"										
1 1/2"	.4	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50
2"	.4	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50
2 1/2"	.4	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50
3"	.45	.563	.675	.788	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69
3 1/2"	.45	.563	.675	.788	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69
4"	.5	.625	.75	.875	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88
5"	.5	.625	.75	.875	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88
6"	.6	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25

E-102-B

LABOR: DRILLING BY POWER, AND INSTALLATION WITH BOLTS. IF THREADED HOLES ARE REQUIRED TO BE TAPPED ADD 30% TO ABOVE FIGURES.

3-58

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CONDULETS "HY WALL THREADED"
TYPES "A - B & E"

COND. SIZE	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/2"	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83
3/4"	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83
1"	.27	.34	.41	.47	.54	.61	.68	.74	.81	.88	.95	1.01
1 1/4"	.30	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13
1 1/2"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
2"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
2 1/2"	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
3"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
4"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
		TYPES C - LB - LR - LL - LF - L - LBB - LFE - LRB										
1/2"	.27	.34	.41	.47	.54	.61	.68	.74	.81	.88	.95	1.01
3/4"	.3	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13
1"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1 1/4"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1 1/2"	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
2"	.4	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50
2 1/2"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
3"	.48	.60	.72	.84	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80
4"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03

E-102-B

LABOR: INCLUDES HANDLING MATERIAL AND INSTALLING UNIT.

3-58

Electrical Estimating—III

CONDULETS "HY WALL THREADED"
TYPE T AND TB

COND. SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/2"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
3/4"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1"	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
1 1/4"	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
1 1/2"	.4	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50
2"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
2 1/2"	.48	.60	.72	.84	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80
3"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
4"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03

E-101-B

LABOR: HANDLING MATERIAL AND INSTALLING UNIT.

3-58

Electrical Estimating—III

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News of the industry

edited for Southern readers

Commercial wiring campaign materials

ELECTRICAL CONTRACTORS and utility sales representatives are happily confronted by a market of staggering size—$22½ billion in wiring and electrical service equipment forecast for the next ten years in the commercial/institutional field. This holds true for the ever-increasing use of electrical equipment in all kinds of commercial occupancies—stores, offices, and apartment buildings as well as institutions that are mushrooming to match the fast-growing requirements of our church-and-school-going population.

The National Wiring Bureau's new "How-To" kit, which was officially introduced at the 14th Annual National Wiring Sales Conference in Detroit recently, offers a complete step-by-step approach to more profits in this market. It shows:

1. **How to make** commercial wiring modernization more profitable by talking the prospect's language—by selling Usepower;
2. **How to use** Powerating Sheets as tools to open doors and close sales;
3. **How to find** prospects and quickly size up their needs—including a directory of applications that lists specialized equipment used in more than 50 different occupancies;
4. **How to order** effective and inexpensive promotion materials to increase profits.

This kit also incorporates a series of three sales letters to serve as a guide for contractors in developing new business through direct mail plus samples of the new all-purpose powerating sheet, drugstore powerating sheet and apartment powerating form.

The plan of action is designed to help both in selling the wiring job and in making the job more profitable. Its purpose, like the Housepower program in the residential market, is to open new paths to profits by emphasizing the Usepower of electricity, which, after all, is the key to wiring sales.

Maximum Usepower is what every prospect in the commercial market really wants and needs. In his mind, modernized wiring is only an incidental means to this end. If he senses a genuine interest on the part of the electrical contractor or the utility sales representative in helping him get the benefits of maximum Usepower, the need for better wiring will become self-evident.

Maximum Usepower enables the prospect to take advantage of lots more electrical equipment than he's able to use now . . . such as air conditioning, better lighting systems, labor-saving and cost-cutting machines, and hundreds more. It makes the equipment he has operate more efficiently and economically. It lets him add more and provide for future expansion and flexibility. It gives him full use of the electricity he pays for by eliminating line loss and improving power factor. It protects him against fire hazard caused by overloaded circuits, may often make savings possible on his fire insurance rates. By making possible the use of more modern equipment, it increases the efficiency of his employees. It attracts more customers by making his place of business more comfortable and more attractive.

These are only some of the benefits of maximum Usepower. The commercial wiring modernization program is a way of showing these benefits to the prospect. That is just one reason why the "How-To" kit should prove a valuable asset in planning the sales approach.

Sample copies may be obtained by writing directly to the National Wiring Bureau, 155 East 44th Street, New York 17, N. Y. In addition, a newsletter, "Commercial Wiring Idea Exchange," will be issued from time to time for the purpose of keeping interested parties posted on the latest developments in the commercial/institutional wiring field in general, and the Bureau's plan of action particularly.

Copies of the newsletter are available upon request to utilities, electrical distributors, NECA chapter managers, electrical contractors, electrical associations and leagues, adequate wiring bureaus, electrical manufacturers, architects, builders, consulting engineers and interested trade associations.

Building revolution brings trades revision

THE HOME BUILDING industry will change so much in the next ten years that it will create a whole new group of trades and professions, according to *House & Home*,

The "How-To" Kit illustrated above will provide effective tools for promoting the commercial/industrial wiring modernization program.

Bonus lighting ...yours with Catalina

Everyone gets a big Bonus with the exciting, new Catalina! A big *bonus in unitized polystyrene,* a special Benjamin lightweight construction that assures straight-line, quick, easy, economical installation! A *bonus in streamlined beauty* with extremely low silhouette. A *bonus in comfort lighting* with a balanced upward component for controlled brightness contrast. A *bonus in value* with a price much lower than you'd expect to pay for this quality fixture. Suspended or surface mounted . . . your bonus beauty is Catalina!

R-358

BENJAMIN

...always the source of good lighting

Now Setting the Pace in COMMERCIAL LIGHTING

FOR DESCRIPTIVE BULLETIN ON CATALINA, WRITE BENJAMIN ELECTRIC MFG. CO., DEPT. Z-1, DES PLAINES, ILLINOIS

the industry magazine of home building. The magazine predicts new trades will be required in old places, and old trades in new places.

"Carpenters—the most versatile home building workers today—must become all-round mechanics, ready and able to do all the on-site assembly of factory-built components. Plumbers and electricians will do most of their work in fabricating plants, all year round and under controlled conditions. Painters will work in plants too, with spray guns or paint baths instead of little brushes," says *House & Home*.

The home of the mid-1960's, says the magazine, "will require architects who are true industrial designers, with a rare talent for achieving new beauty with unaccustomed materials . . . It will require builders who can assemble a vast variety of factory-finished components as skillfully as their fathers framed a house with nails and 2x4's. . . It will require realtors who can not only sell new houses to people who want the new way of life, but also take their old houses in trade to sell to those who are satisfied to just get shelter and space."

The reason for all this change (the magazine calls it a "technological breakthrough") will be a critical shortage of labor which will develop in about ten years time. And to help the home building industry double its production (which a boom of war baby marriages will necessitate) right at the time labor and materials are getting short, "technology is coming to the rescue with a flood of new building materials and methods."

What about traditional trades and skills? "The fact is," says the magazine, "that the house of 1961 will still use plenty of brick, block and stone—because, after all, man can not live by polyethylene alone."

Adequate home wiring movie made available

ADEQUATE home wiring for modern electrical living is the theme of a new 26-minute color movie produced by and currently available from the Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa.

Three well-known motion picture—television stars have principal roles in the film entitled "A Family Affair," which is built around a teen-ager who learns from personal experience that inadequate electric power can often cause a number of problems.

The film is available on loan without charge, or can be purchased outright, and is suitable for showing to social and service groups, civic organizations and professional groups.

Light for Living standards revised

LIGHTING REQUIREMENTS for small, average, and large home living areas are included in the revised 1958 edition of the Light for Living standards issued recently by the American Home Lighting Institute, trade association of fixture manufacturers and distributors.

Revised to make them more specific and easier to follow, the standards are being used as the minimum lighting requirements in the Live Better Electrically Medallion Homes program, and in the institute's own Light for Living Award program, according to Ted Cox, managing director of the institute.

The revised standards specify lighting requirements for living areas under 125 sq. ft., for areas between 125 and 225 sq. ft., and for areas over 225 sq. ft., and include both ceiling fixtures and structural (built-in) lighting.

In the kitchen, the standards specify the incandescent and fluorescent fixture types and sizes required for general lighting, as well as the fixtures required for local lighting in front of the kitchen window, and over the sink, range, and work counters.

"Lighting requirements in other parts of the home are also made more specific and easier to follow in the new standards," Cox said.

"For instance, in bathrooms and lavatories, specific wattage requirements are spelled out for the first time."

Even with the addition of various details, the standards are still boiled down to the point where they take up only one page.

The institute published the first edition of the standards in August, 1957. Since that time, Cox said, they have already eliminated much of the vagueness that existed about what fixtures are needed in a particular home.

"Also proving effective is the Light for Living award program, initiated by the institute at the same time the first standards were published," Cox said.

This program awards certificates to builders who install lighting

MINIMUM LIGHT FOR LIVING STANDARD

GENERAL REQUIREMENTS

1. All incandescent bulbs and fluorescent tubes shall be shielded in a manner which will minimize glare (except in closet and storage areas). Flashed opal and ceramic enameled glass and diffusing plastic materials are satisfactory for shielding incandescent bulbs. Materials having less diffusion (frosted or configurated glass) are satisfactory for shielding fluorescent tubes.

Low wattage (25w or less) lamps should be used in chandelier type fixtures that are equipped with clear or frosted glass shades for decorative effect. This type of fixture should be supplemented with structural lighting as indicated in "B" below.

2. A minimum of one fixture shall be controlled by a wall switch at the entrance of each room. Where ceiling fixture is not installed, a minimum of one wall bracket, valance, cove or cornice lighting unit must be wall switched at the room entrance.

3. Where traffic pattern into a room is from two directions and more than ten feet apart, three-way control on general lighting is desirable.

LIVING AREAS

1. Living areas within the scope of this standard include the living room, dining room or dinette, recreation, den, bedroom, study, library, reception hall, sun room, enclosed porch and other living areas not specifically covered. The size of the room or area to be lighted determines the lighting requirement. In the following table two alternate methods are given for each room size:

	A. Ceiling Fixtures		B. Structural Lighting
Room Size	Min. Size of Shield	Minimum Wattage	(Length of light source in cornice, cove or valance)
Very small (Up to 125 sq. ft.)	13" — 15"	1 100w or 3 40w	6 feet
Average (125 — 225 sq. ft.)	15" — 17"	1 150w or 3 40w	8 — 12* feet
Large (Over 225 sq. ft.)			16 — 20* feet

** Preferred in major living areas, such as living room, recreation room, etc. Recessed fixtures are acceptable for general lighting only when one 9"—12" box (100-150w) is provided for each 60—50 sq. ft. of floor area.*

A combination of fixtures and wall lighting is desirable for added flexibility or lighting, especially in recreation or family room.

KITCHEN AREA GENERAL LIGHTING (Use "A" or "B")

A. A minimum of one 12" diameter fixture to accommodate one 150w; two 75w; or three 60w bulbs.

B. A minimum of two 30w; four 20w; or 2 circline fluorescent lamps.

KITCHEN AREA LOCAL LIGHTING

1. Sink in front of window — use "A" or "B" above ("B" should be shielded)
2. Sink under cabinets — see below
3. Range and Work Counters — Wall bracket using a minimum of one 20w fluorescent or two 40w incandescent for each four feet of counter.

HALLS—PASSAGEWAYS

1. For each hall or passageway use a minimum of one ceiling fixture, wall bracket or recessed fixture to accommodate 100w bulb. One such fixture is required for every ten feet of hall or passageway.

BATHROOMS AND LAVATORIES (Use "A" or "B")

A. One fixture located at each side of grooming area and one fixture located on ceiling or wall over grooming area. Each of these should accommodate one 20w fluorescent or one 60w or two 40w incandescent.

B. For wall-to-wall mirrors a double row of shielded fluorescent tubes extending full width of mirror.

LAUNDRY-UTILITY-WORKSHOP-BASEMENT

1. A minimum of one ceiling or wall fixture over each principal work area. Ceiling fixtures same as Kitchen "A" or "B". Wall lighting as Kitchen local lighting No. 3.

STAIRWAYS

1. A wall or ceiling fixture shall be installed at top and bottom of each stair flight.

FULL DOOR CLOSETS

1. A minimum of one lamp receptacle or fixture for each full-door closet.

ACCESSIBLE UNFINISHED ATTIC AND STORAGE AREAS

1. A minimum of one fixture or wall bracket for each 200 sq. ft. of floor area.

GARAGE OR CARPORT

1. A minimum of one lamp receptacle or fixture using one 100w bulb at both sides of each parking area.

OUTSIDE THE RESIDENCE

1. A minimum of one or more fixtures at each entrance of the residence.

‡2. One or more directional fixtures or post lanterns are desirable for protective lighting yard and driveway entrance areas. These should be controlled inside house.

‡3. One or more weatherproof outlets are desirable for yard maintenance, holiday lighting or for outside appliance use. One or more of these should be controlled inside the residence.

Items marked (‡) will provide additional safety, comfort and flexibility, and will increase the sale and resale value of the home.

Builders who meet these standards are eligible to receive the Light for Living Award of the American Home Lighting Institute. The local public utility must send a letter to the AHLI, stating the home builder has met the standards. AHLI will then mail award certificates to the utility or to the home builder. Builders who meet these lighting standards plus wiring and appliance standards set by the utility in the LIVE BETTER ELECTRICALLY MEDALLION HOME program are eligible to receive the LBE Medallion and the sales promotional benefits of that Medallion. (Revised 1958)

AMERICAN HOME LIGHTING INSTITUTE
360 N. Michigan Avenue Chicago 1, Illinois

fixtures in accordance with the Light for Living standards. They are provided to the builder on receipt of a certifying letter from the local utility, stating that the builder has adhered to the standards.

The builder then displays the certificate in his model home or sales office telling home viewers that the home has met all the requirements for safe, comfortable lighting.

The new standards are specified as the minimum lighting requirements in the Live Better Electrically Medallion Homes program. LBE awards a bronze medallion to builders meeting certain specifications for wiring, appliances, and lighting.

EEI offers economic fundamentals course

AN EMPLOYEE course in the fundamentals of American economic progress is being offered to its member companies by the Edison Electric Institute, it has been announced by the electric company trade association.

"The American Economic System," as the course is named, is designed to be given as a six-month program by company conference leaders in one-hour-a-month classes for employee groups.

To achieve a high level of employee interest and understanding, colored filmstrips, demonstration materials, and an illustrated 96-page book are used to present factual information derived from government publications and other authoritative sources. A leader's manual, included in the course kit, offers suggestions and guidance for conducting the course, and documents the facts.

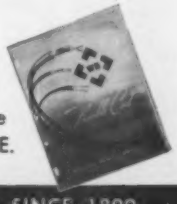
"The American Economic System" course was developed over a period of years to give the facts about a number of economic topics which surveys indicated were widely misunderstood.

The subjects covered by the course include: accomplishments of the American economic system, distribution of national income, division of income within a business, size of profits, relationship between productivity and wages, relationship between machines and jobs, nature and sources of capital for tools, and future possibilities of the American system.

The basis for the course is the 96-page book, which has just been published in a revised edition, utilizing the most up-to-date and authoritative information available. Designed for distribution to all employees taking the course, the book reproduces practically the entire sequence of filmstrips in color, as well as providing addi-

Where portable cord takes a beating because of rugged work conditions, WHITNEY BLAKE DYNAPRENE stands up and gives long, economical service.

DYNAPRENE has an especially tough neoprene jacket, it resists abrasion, has high flexibility and long flex life, and provides premium quality service at competitive prices.



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WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE COMPANY

NEW HAVEN 14, CONNECTICUT

tional information on the points covered in the program.

Since its initial appearance eight years ago, "The American Economic System" has won three George Washington Honor Medals from the Freedoms Foundation for the book, the leader's manual, and the filmstrips.

Preformed completes research facilities

PREFORMED LINE Products Company held open house recently at their newly completed Research and Engineering Center in Cleveland. The half-million-dollar center was built to study physical problems of overhead transmission and distribution and to set up its concentrated program to develop improved and new line accessories.

The center houses twenty pieces of major testing equipment, chemical laboratory facilities, machine shop, technical library, photographic studio and engineering offices. The one-floor layout covers 20,000 square feet, and part of the roof is utilized for outdoor testing.

Equipment in the lab is of a very specialized nature; most of it designed principally by Preformed engineers. Among the large testing equipment are six vibration spans —four of them 125 feet long—for simulating field conditions. All testing equipment is on the ground floor except for the cyclic current splice test rack exposed to the elements on the roof.

Chemical lab facilities are used for working with plastics, adhesives and special types of inhibiting greases. Here, Preformed engineers investigate plastics for coating metals and for fabricating special products. Though most Preformed products are metal, several —like some spacers and lineguards —are fabricated from plastic or coated with plastic.

The volumes of technical data recorded are filed in the technical library along with technical papers, trade publications and a wide variety of reference material. A trained librarian is in charge.

Requirements for pictorially recording tests and specimens necessitate a photographic studio and fulltime photographer. Photographs of experimental work or new products can be rushed to the field as soon as they are ready for release. The pilot models are produced in the center's machine shop, where engineers can actually follow the specimens as they are being fabricated.

All forty of the people working at the Research and Engineering Center are under the supervision of Jon R. Ruhlman, vice-president and director of Research and Engineering. Assistant director of research and engineering is James C. Poffenberger. Lab work is directed by E. A. Capadona.

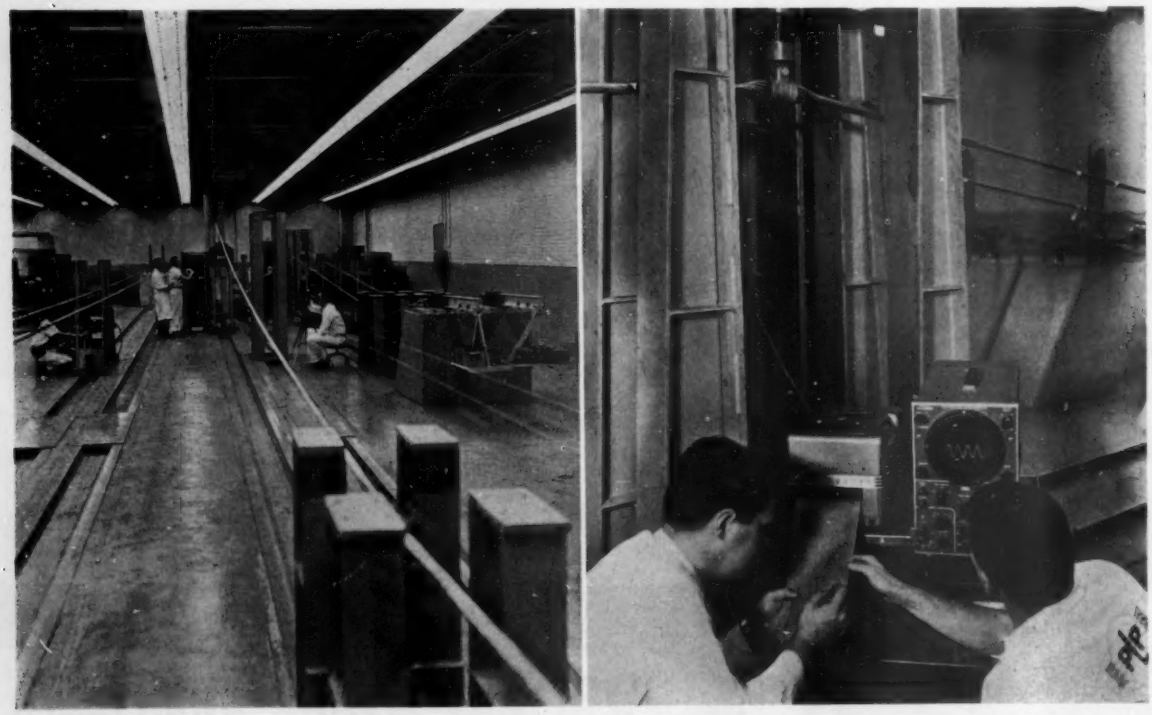
Preformed Line Products was founded in 1947 by Thomas F. Peterson. The company now manufactures forty different kinds of line accessories in some 6,000 designs for use in the electric light, power, and telephone industries.

Anaconda builds new Georgia plant

GROUND - BREAKING ceremonies took place recently for Anaconda Wire and Cable Company's new $1,000,000 plant in Watkinsville, Georgia. The new facility is being built to serve the growing Southeast markets and will become Anaconda's eighth manufacturing plant.

The building will be of one-story concrete slab and glass construction erected on a 175-acre site. The plant will include facilities for manufacturing, as well as warehousing space for stocking a complete line of wire and cable products and accessories. It is expected that approximately 100 persons will be employed and plant completion is scheduled for Fall.

David T. Werner, who has been



At left, wind-induced aeolian vibration is simulated on vibration spans during endurance tests of Preformed armor at the new research and engineering laboratories of Preformed Line Products Co. At right, strain-gauges monitor conductor stresses in non-destructive testing of Armor-Grip Suspension units.

NEW...from APPLETON

24" High-Bay Mercury Vapor Lighting Units

higher production . . . fewer rejects . . . improved employee relations . . . extended safety records

more effective illumination at the work level!

Here is a precision-designed lighting unit for large industrial interiors and high-bay plant areas. High illumination levels without uncomfortable glare... Ventilated hood for lower operating temperature and minimum dirt accumulation... the new APPLETON 24" High-Bay Mercury Vapor Lighting Unit is a unique combination of technical features which give you more useable illumination at the work level. Available in: 1 pc. socket type construction or with the 2 pc. APPLETON DISKONECT time-saving maintenance feature. (Permits both lamp and reflector to be removed as a complete unit without disturbing wiring!) Reflecting surfaces are of ALZAK* processed aluminum. Available for concentrating or spread-type illumination distribution. For use with 1,000 Watt Mercury Vapor Lamps, this new APPLETON 24" High-Bay Mercury Vapor Lighting Unit is designed to meet your specific needs. As with all APPLETON Industrial Lighting Products... you can *see* the difference!

*A proprietary term of Aluminum Company of America

Sold Through Franchised Wholesalers Only

APPLETON ELECTRIC PRODUCTS ®

APPLETON ELECTRIC COMPANY
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Also Manufacturers of:

"ST" Series Connectors

Outlet Boxes

Malleable Iron Unilet Fittings

Reelites

TRADE ARRO MARK

MACHINE SCREW ANCHORS

Easy to install . . . requires shallow hole . . . fixture can be removed and replaced without loosening anchor . . . a few hammer blows set anchor firmly . . . conical-shape nut expands lead sleeve to provide strong holding power . . . widely used by electricians, plumbers, carpenters, ornamental iron workers, maintenance men, awning and sign men and other tradesmen.

Cutaway drawings show how setting tool expands lead sleeve around conical nut.

HAMMERLESS SETTING TOOL

Expander hammerless setting tool for easy installation of Arro Machine Screw Anchors in hollow tile, bottomless or weak-bottom holes.

THE ARRO LINE OF MASONRY ANCHORING AND DRILLING DEVICES

DISTRIBUTORS:
This Advertisement Appears in Leading Publications Directed to Your Customers

TRADE ARRO MARK

ARRO EXPANSION BOLT COMPANY
Department A, P. O. Box 388, Marion, Ohio

district sales manager of Anaconda Wire and Cable's office in Charlotte will be manager of the new plant. The construction contract was awarded to Thompson-Street Co., of Atlanta and Charlotte.

Manufacturers appoint new representatives

R. E. UPTEGRAFF Manufacturing Co., of Scottdale, Pa., has appointed H. L. Macon, of Atlanta, Ga., as special representative. Mr. Macon will handle only utility contracts in the states of North and South Carolina, Georgia, Alabama and Florida.

* * *

ARRO EXPANSION BOLT Company has named C. J. Sampson of St. Louis, Mo., as sales representative in the electrical supply field in

C. J. Sampson

eastern Missouri, southern Illinois and western Kentucky. Mr. Sampson and associates will also supervise Arro's St. Louis warehouse operation.

* * *

PASS & SEYMOUR, Inc., recently announced the appointment of Glennon D. Kenny of St. Louis,

Glennon D. Kenny

Mo., as sales representative for the Missouri, Arkansas, Tennessee, and Mississippi area.

The most revolutionary innovation in ceiling lighting fixtures in years!

PURITAN'S

TWIST 'n DROP PAT. PEND.

RE-LAMPING and CLEANING EASE with ADDED SAFETY

3 SIMPLE MOVEMENTS

1. Twist knob to release catch allowing fixture to drop on spring.
2. Swing glass to one side or another, for bulb replacement and cleaning ease.
3. Return glass to normal position. Twist knob . . . and THERE YOU ARE.

PULLEY GLASS DROP

Remove knob or ring. Bottom glass drops and swings into position for re-lamping or cleaning.

Return glass to original position and replace knob or ring.

SIMPLE —

SAFE —

SURE

Be sure you have all the new Puritan styles that "TWIST-'N-DROP" . . . the greatest new feature and most outstanding improvement in ceiling lighting fixtures . . . in years.

AS SEEN IN *House Beautiful* MAGAZINE

ONLY **puritan** ceiling fixtures feature TWIST 'n DROP

Write for New, colorful catalog:

PURITAN *lighting fixture co.* 19-25 BOERUM STREET BROOKLYN 6, N. Y.

Dates Ahead

American Institute of Electrical Engineers, Textile Conference, Georgia Institute of Technology, Atlanta, Ga., March 13-14, 1958.

International Association of Electrical Inspectors, Georgia Chapter Meeting, Daniel Ashley Hotel, Valdosta, Ga., March 24-25, 1958.

Edison Electric Institute, 24th Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 24-27, 1958.

Oklahoma Utilities Association, Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28, 1958.

American Institute of Electrical Engineers, Pulp and Paper Conference, North Carolina State College, Raleigh, N. C. March 27-29, 1958.

Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., March 31-April 2, 1958.

American Institute of Electrical Engineers, Southwest District Meeting, Mayo Hotel, Tulsa, Okla., March 31 - April 2, 1958.

International Association of Electrical Inspectors, South Carolina Chapter Meeting, Columbia Hotel, Columbia, S. C., April 3-4, 1958.

International Association of Electrical Inspectors, Ellis Cannady Chapter, Carolina Hotel, Raleigh, N. C., April 8-9, 1958.

Illuminating Engineering Society, East Central Regional Conference, Richmond, Va., April 14-15, 1958.

Protective Relay Conference, Eleventh Annual Conference, Texas A&M College, College Station, Tex., April 14-16, 1958. Write L. M. Haupt, Conference Chairman.

Southeastern Electric Exchange, Heat Pump Steering Committee, Leisure House, Tampa Electric Co., Tampa, Fla., April 16-18, 1958.

International Association of Electrical Inspectors, Alabama Chapter Meeting, Hotel Stafford, Tuscaloosa, Ala., April 17-18, 1958.

International Association of Electrical Inspectors, Tennessee Chapter Meeting, Andrew Jackson Hotel, Nashville, Tenn., April 21-22, 1958.

Southeastern Electric Exchange, Engineering and Operation Section, Buena Vista Hotel, Biloxi, Miss., April 21-22, 1958.

Illuminating Engineering Society, South Central and Southeastern Joint Regional Conference, Hotel Lafayette, Little Rock, Ark., April 24-25, 1958.

International Association of Electrical Inspectors, Baton Rouge Chapter, Baton Rouge, La., April 28, 1958.

American Institute of Electrical Engineers, Middle Eastern District Meeting, Washington, D. C., April 28-30, 1958.

Illuminating Engineering Society, Southwestern Regional Conference, Shreveport, La., April 28-29, 1958.

American Institute of Electrical Engineers, Middle Eastern District Meeting, Washington, D. C., April 28-30, 1958.

Illuminating Engineering Society, Midwestern Regional Conference, Kansas City, Mo., May 1-2, 1958.

International Association of Electrical Inspectors, George Welman Chapter, New Orleans, La., April 29, 1958.

International Association of Electrical Inspectors, Joint Meeting (Baton Rouge, George Welman, North Louisiana—East Texas, Texas Gulf Coast, and North Central Division Texas Chapters, Angelina Hotel, Lufkin, Texas, May 2-3, 1958.

American Public Power Association, Annual Meeting, Roosevelt Hotel, New Orleans, La., May 6-8, 1958.

International Association of Electrical Inspectors, Florida Chapter Meeting, Cherry Plaza Hotel, Orlando, Fla., May 8-10, 1958.

National Industrial Service Association, Silver Jubilee Celebration, Hotel Roosevelt, New Orleans, La., May 11-14, 1958.

International Association of Electrical Inspectors, Virginia Chapter Meeting, Ingleside Inn, Staunton, Va., May 12-13, 1958.

Edison Electric Institute, Electrical Equipment Committee, Radisson Hotel, Minneapolis, Minn., May 12-13, 1958.

American Institute of Electrical Engineers, East Central District Meeting, Huntington, W. Va., May 13-15, 1958.

Southeastern Electric Exchange, Industrial Power Sales Conference, Edgewater Gulf Hotel, Gulfport, Miss., May 29-30, 1958.

National Telemetering Conference, (AIEE-ISA-IAS), Lord Baltimore Hotel, Baltimore, Md., June 2-4, 1958.

National Association of Electrical Distributors, 50th Annual Convention, Civic Auditorium, San Francisco, June 9-13, 1958.

American Institute of Electrical Engineers, Summer General Meeting, Buffalo, N. Y., June 22-27, 1958.

American Institute of Electrical Engineers, Petroleum Industry Conference, Baker Hotel, Dallas, Sept. 15-17, 1958.

Edison Electric Institute, Meter and Service Committee, Plaza and Driscoll Hotels, Corpus Christi, Texas, Sept. 22-24, 1958.

Southeastern Electric Exchange, Engineering and Operation Section, Hotel Roanoke, Roanoke, Va., Oct. 20-21, 1958.

International Association of Electrical Inspectors, Southern Section Thirtieth Annual Meeting, McAllister Hotel, Miami, Fla., Oct. 20-22, 1958.

National Association of Corrosion Engineers, South Central Region Annual Conference and Exhibition, Roosevelt Hotel, New Orleans, Oct. 20-24, 1958.

National Electrical Contractors Association, Annual Convention, Dallas, Texas, Nov. 19-22, 1958.

Donald Marsden

SIERRA ELECTRIC Corporation has selected Donald A. Marsden to distribute their line of wiring devices and wall plates in North and South Carolina. The Marsden Sales Company, with headquarters and warehouse facilities in Charlotte, was organized in 1952.

* * *

BRYANT ELECTRIC Company, of Bridgeport, Conn., has appointed William I. Vawter as sales representative in the Atlanta territory for the company's line of wiring devices.

* * *

ALLIS-CHALMERS has named the Drillmaster Supply and Manufacturing Co., Inc., 1117 E. Division St., Evansville, Ind., distributor for A-C motors, control, pumps, and transformers in southern Indiana and western Kentucky. Drillmaster was established in 1949 and is headed by J. E. Rutledge. Kenneth R. Horn is secretary-treasurer and Kenneth C. Horn heads the sales department.

Gulf Power Company occupies new building

GULF POWER Company recently occupied their new million dollar, five-floor general engineering and sales office building in Pensacola, Fla. Construction of the new building was part of a thirty million dollar expansion program drawn up in 1957.

Ground space covers 185 x 300 feet, with 60,000 square feet of floor space. Adjacent to the four floors plus basement structure are warehouse and service buildings with a VHF rado transmitting tower by which all company service trucks may be contacted on the road.

The solar-windowed structure, of reinforced concrete construction, has a brick masonry and aluminum panel exterior. The impressive interior is of ceramic and marble.

Growth of the Gulf Power Company, a subsidiary of the Southern Co., is indicated by the 556 per cent increase in electric sales in the past ten years.

Gulf Power Company's new million dollar building in Pensacola contains 60,000 sq. ft. of floor space and houses general engineering and sales offices. The utility serves a 7,200 sq. mi. area in Northwest Florida.

Pease Air Force Base
Capehart Housing, Portsmouth, N. H.
Davison Construction Co., Inc.
Gen. Contractor
E. S. Boulos Co., Electrical Contractor

TO GET MORE JOBS LIKE THIS...

* USE UNION NO CLAMP BOXES

1. Cost Less
2. Rough-in Faster
3. Save Wiring Time

*(See Sec. 3710.c.N.E.C.)

#4040-602 with #4043 Plaster Ring

#7050-202

C.S.A. App.

UNION INSULATING CO.
PARKERSBURG, WEST VIRGINIA

News about people

Raybro Electric Supplies, Inc., announced recently from company headquarters in Tampa, the appointment of **William T. (Bill) Brown** to the newly created position of general sales manager. He will have full responsibility and supervision of supply, industrial, utility and REA, lighting, lamp and merchandise sales, as well as the company's advertising and sales promotion.

William T. Brown

Since joining Raybro in 1937, Mr. Brown has held positions in warehouse shipping, counter sales, merchandise service, sales promotion, and industrial and specialty sales. He has been manager of the Orlando and Miami branch operations and most recently was statewide manager of supply sales.

Frank J. Healy, president of **Sylvania Lighting Products,** a division of Sylvania Electric Products Inc., has announced the appointment of four divisional vice-presidents.

Appointed were **Henry F. Callahan,** general manager, to vice-president, lighting products; **O. Howard Biggs,** chief engineer, to vice-president, engineering; **Garlan Morse,** general sales manager, to vice-president, lighting sales; and **George C. Connor,** general sales manager, photolamps, to vice-president, photolamp sales.

Several personnel changes in preparation for a program of product line expansions have been announced by **N. J. MacDonald,** president of the **Thomas and Betts Company.**

New executive appointments include **Karl G. Kempf,** vice-president in charge of the Sta-Kon Division; **C. A. Biddulph,** vice-president in charge of the Eastern Division; and **Carroll A. Badeau,** administrative vice-president and chief engineer.

Robert McK. Thomas continues as senior vice-president, while **Edward C. Hewitt** is vice-president in charge of sales.

Billy R. Conner, sales representative in Florida, will serve as manager of the Florida District. **James E. Williams,** sales representative in St. Louis, has been named manager of the newly formed St. Louis District.

Promotions for two **A. B. Chance Company** sales executives, **Jackson T. Isbell** and **L. C. Hansen,** were announced recently by **F. Gano Chance,**

Jackson T. Isbell

president of the company. Mr. Isbell was named assistant to the president, and Mr. Hansen was appointed vice-president of marketing.

Mr. Isbell joined the company in 1928, and advanced to sales manager in 1936, west coast division manager in 1946 and, since 1949, has been vice-president in charge of sales. He was elected to the board of directors in 1933.

Hansen started with Chance as a sales engineer in 1947, became assistant to the sales manager in 1948,

L. C. Hansen

sales manager in 1950 and director of marketing in 1957. He was elected to the company's board of directors in 1955.

W. B. Owens

Ohio Brass Company has announced the retirement of **Julian A. (Tony) Whatley** as district manager for Georgia, Alabama and part of Tennessee following thirty-one years employment with the company.

William B. Owens will now serve as district manager for Georgia, Florida and Alabama, cooperating in the latter state with Shook and Fletcher. Prior to his eight years association with Ohio Brass, Mr. Owens was employed by a southern utility company. He is a graduate of Georgia Tech.

Kirkwood Otey

Kirkwood "Pete" Otey becomes district manager for North and South Carolina (formerly handled by Mr. Owens) and that section of Tennessee formerly handled by Mr. Whatley. Mr. Otey received his engineering degree from Clemson College and was connected for five years with a manufacturer's agent as a sales representative in North and South Carolina and Tennessee.

Howard J. Thomas has been appointed manager, wholesale and utility sales, of the Westinghouse lamp division. The announcement was made by **Robert D. Barr,** general sales manager for the division.

In his new assignment Mr. Thomas will participate in the broad planning of the division sales operation. He will have special responsibility for activities concerning utilities, rural

electrification administration and primary wholesale distributors in the electrical and hardware fields.

Mr. Thomas joined Westinghouse in 1943, as a buyer in the small motor division. He later joined the Westinghouse Sales Company (Wesco) as a

Howard J. Thomas

district sales supervisor for lighting and lamps. In 1950 he was appointed a lamp division district sales manager.

Mr. Thomas studied at the University of Cincinnati and completed an International Correspondence School course in electricity and engineering.

Roy C. East has been named advertising manager of **Bryant Manufacturing Company,** according to an

Roy C. East

announcement by **David W. Hoppock,** vice-president and general sales manager of the heating and air conditioning organization.

Mr. East joined Bryant in 1955 as assistant advertising manager after five years with Associated Distributors, Inc., of Indianapolis, where he was advertising and sales promotion manager. He previously had been on the national advertising staff of The Indianapolis Times.

Mr. East will direct Bryant's advertising and sales promotion program through the company's national distributor-dealer sales organization. Mr. East is a graduate of Indiana University.

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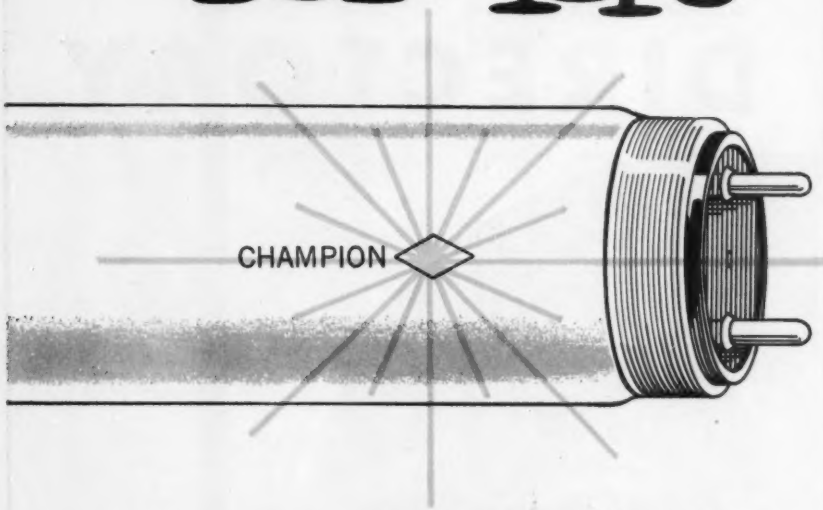

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MILLIONS OF LAMPS A YEAR . . .
ONE PLANT standard of quality control

With all manufacturing concentrated in the big, modern plant shown above, every Champion lamp is subjected to a single, high standard of quality control.

Uniform control like this is one more example of how Champion applies Lightmanship to make sure you always get all the light you pay for in Champion lamps.

CHAMPION LAMP WORKS
Lynn, Massachusetts
A division of Consolidated Electric Lamp Co.

CHAMPION Lamps
Incandescent Fluorescent
Your best buy in lamps

Anaconda Wire & Cable Company announces the following organizational changes and appointments:

Bruce Van Wagner, formerly manager of telephone cable and building wire sales, was named marketing manager. Mr. Van Wagner will be responsible for developing and coordinating long-range marketing programs.

William Olsen, formerly assistant manager of building wire sales, was appointed manager of building wire sales. **Robert McIlvane** was appointed manager of communication cable sales.

Thomas Jackson was selected to serve as assistant manager, industrial sales and **Antrony L. Spina** was named assistant sales promotion manager.

General Switch Company, manufacturers of enclosed safety switches and service entrance equipment, has announced the appointment of **Stephen Chaika** to the position of vice-president in charge of sales.

A graduate electrical engineer, Mr. Chaika joined General Switch in 1949 as New York City salesman and subsequently became national sales supervisor. He was previously associated with Sperry Gyroscope Co.

Earl F. Miles has been appointed national sales manager for **Litecraft** Manufacturing Corporation. **Edwin R. Manning,** vice-president, sales, in making the announcement stated that Mr. Miles' business and educational background make him especially well suited to play an important role in the growth of the company.

His business career has encompassed his own highly successful electrical distributing company, six years as a sales representative in the State of Indiana for several nationally

Earl F. Miles

recognized lighting companies, and engineering research and development work for a major producer of lighting equipment. Mr. Miles is a graduate architectural engineer with post graduate studies in mathematics, physics, and chemistry.

John H. Schuler has been appointed vice-president in charge of operations at **Anderson Electric Corporation,** it has been announced by **Thomas H. Fox,** president.

Mr. Schuler will now supervise manufacturing, purchasing and personnel at Anderson's Birmingham

John H. Schuler

and Leeds, Alabama, plants. Before assuming his new duties Mr. Schuler was administrative vice-president. He is a graduate of Alabama Polytechnic Institute.

Three appointments in the **General Electric** Distribution Transformer Department's marketing section have been announced by **James L. Elrod,** marketing manager.

Harold Brunton, Jr., former manager of advertising and sales promotion, has been named manager—network transformer sales, a new post.

Harold D. Beck, manager of marketing planning and personnel development in the Power Transformer Department, has been named manager of marketing administration and personnel development in the Distribution Transformer Department.

Bruce H. Burnham, specialist in advertising and sales promotion, will have charge of that function for distribution transformers, succeeding Brunton.

The appointment of **H. Robert McClellan** as sales manager of the newly created southern region of Sylvania Lighting Products, a division of **Sylvania Electric Products Inc.,** has been announced by **Garlan Morse,** divisional vice-president-lighting sales.

Headquarters for the new region encompassing the Atlanta, Charlotte, and Dallas districts will be maintained at Sylvania's Atlanta, Ga., office.

Atlanta district sales manager since 1951, Mr. McClellan has named **James F. Hagan,** district sales supervisor, to succeed him.

Mr. McClellan, a graduate of Davidson College, joined Sylvania in 1947 as a sales representative cover-

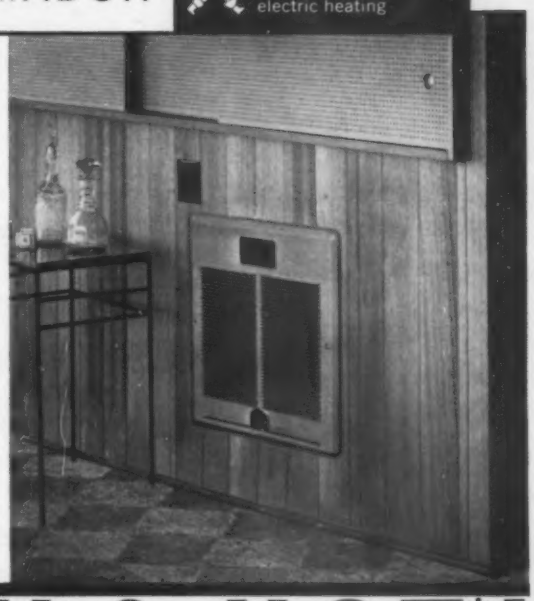
THERMADOR

"Seven Leagues Ahead" in the science of electric heating

THERMADOR MODEL "NB" FAN-TYPE ELECTRIC HEATER

Features:

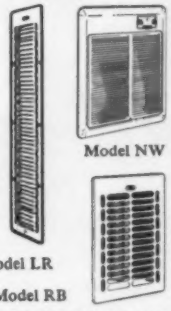
- striking modern design
- fast working...circulates warm air quickly
- clean, dust-free... smart grille aims warm air down, to the living zone
- safe, simple, reliable ...no vents needed, no dangerous gas fumes
- easy to install, flush to the wall
- 1650 watts output, 120/240 volts A.C., ...5630 B.T.U.s per hour



NEW & HOT*!

A Thermador Electric Heater for Every Room

BILT-IN ROOM HEATERS

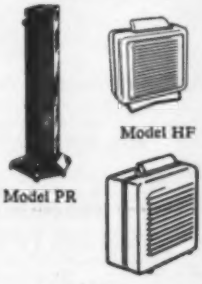


Model LR

Model NW

Model RB

PORTABLE ROOM HEATERS



Model PR

Model HF

Model MHF

***HOT SALES! HIGH PROFITS!**

Here's the newest pride of the Thermador "Bilt-In" Electric Room Heater line... the new, medium wattage fan-type heater especially designed to give quick, circulated warmth in small rooms. Ideal for use in the nursery, den, dressing room, dinette, kitchen and bath. Available with or without thermostatic control in rich Spanish Gold or glossy White baked enamel.

The Originator of the Fan-Type Electric Heater

THERMADOR

ELECTRICAL MANUFACTURING COMPANY

Division of Norris-Thermador Corporation

5119 District Blvd., Los Angeles 22, Calif.

Available from these Thermador Distributors:

Ala., Fla., Ga., Miss., So. Ky., N. C., S. C., Tenn. — H. C. Biglin Co., Inc., 177 Harris St., N.W., Atlanta, Ga.

Ill., Ind., N. Ky., E. Mo.— Klaton Chapman, 11-104 Merchandise Mart, Chicago, Ill.

Kan., W. Mo., E. Neb., Okla. — W. H. Faber Co., P.O. Box 7043 C.C. Sta., Kansas City, Mo.

Ohio — Robert E. Williams, 19119 Wickfield Ave., Cleveland, Ohio

Ark. — C. A. Birmingham, 3546 Oakley Ave., Memphis, Tenn.

La., Tex. — W. E. Tallman, 2236 Sutter St., Dallas, Tex.

Md., Va., W. Va. — Warren J. Gottemeyer, Apt. E, 411 Hunting Towers, Alexandria, Va.

ELECTRICAL SOUTH
806 Peachtree St., N.E.
Atlanta 8, Ga.

March, 1958

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Please send me additional information on items mentioned in this issue of Electrical South. I have listed the key numbers of these items at right.

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NEW! Electric Thrift Trim
BASEBOARD HEETAIRES
Thrift Trim
ENGINEERED EXCLUSIVES:
• Double Strong Core HEETAIRE Elements
• Finned Heat Exchangers
• Perma-Braze Construction
• Double Baffle Air Flo Distribution
• Built-In Automatic Heavy Duty Hydraulic Thermostat
GIVES YOU
MORE HEAT-LESS COST!
Costs Less To Buy!
More wattage per foot means less footage to buy! (Over 300 watts per foot with safe, comfortable surface temperature)
Costs Less To Install!
Snap-off cover panel (no screws), splice leads, mount unit to wall in seconds, snap cover back on. Splice boxes prewired to elements... lift out to reverse for ease in joining Heetaires.
Automatic or Manual Heetaires in 24", 48", 72" and 96" sizes. From 500 to 3000 Watts.
Write, wire or phone for FREE BASEBOARD FOLDER
MARKEL ELECTRIC PRODUCTS, Inc.
LA SALLE PRODUCTS, Inc.
Founded 1920 • BUFFALO 3, N. Y.
Export Office: 15 MOORE ST., NEW YORK 4, N. Y.

ing North and South Carolina.

Mr. Hagan joined Sylvania in 1951 as a field representative in Tennessee after initial business experience with electrical supply houses. He was graduated from the University of Georgia.

Oklahoma Utilities Association has announced the retirement of **Kate Allen Niblack,** who has served as

Kate Allen Niblack

secretary and assistant treasurer since 1936. Miss Niblack began employment with the association in 1920. **Thelma T. Jones,** who succeeds Miss

Thelma T. Jones

Niblack has been with the Oklahoma Utilities Association for twenty-one years, having been assistant secretary for six years.

Walter B. Gesell has been appointed director of economics and statistics of the **Edison Electric Institute,** it was announced recently by Edwin Vennard, managing director of the electric utility company trade association.

In his new post, Mr. Gesell heads both the economics and statistical departments of the Institute. He is also serving as secretary of the statistical committee and the power survey committee, Mr. Vennard said.

Mr. Gesell, who joined the Institute last fall as economics director, recently retired as vice-president in charge of operations for the Oklahoma Gas and Electric Co., Oklahoma City. Closely associated with the electric utility industry for more than forty years, he has accepted the EEI appointments on a short-term basis. Mr. Gesell received a Bachelor of Science degree in Mechanical Engineering at the University of Wisconsin.

Paul E. Sheppard has been named staff representative for the electrical equipment and public utilities sections of the **National Safety Council.**

During the past sixteen years Mr. Sheppard has held many safety positions, including safety engineer with Lumbermen's Mutual Casualty Co.; safety director with the Milwaukee Gas Light Co., and safety director with the city of St. Petersburg, Fla.

Mr. Sheppard is a past chapter vice-chairman of the American Society of Safety Engineers and a past chairman of the Wisconsin Utilities Association's accident prevention committee. He is also a past member of the accident prevention committees of the Wisconsin Council of Safety and the American Gas Association.

Dixie Electrical Manufacturing Co., Birmingham, Ala., manufacturers of pole line hardware, recently announced the election by the board of directors of **John A. Dunn** to the office of president.

John A. Dunn

Before joining Dixie, Mr. Dunn was associated with the General Electric Supply Company and a large mid-western utility.

Appointment of **W. F. Eagan** as chief engineer of **Allis-Chalmers** control department has been announced by the company.

Mr. Eagan joined Allis-Chalmers in 1947 and for the last six months had been engineer-in-charge of control engineering. Prior to that he had been supervisory engineer of regulator engineering and circuit development in the department.

COMING APRIL 1958

INSULDUR®

Major Breakthrough for Distribution Transformers J-70839

YOU CAN BE SURE...IF IT'S Westinghouse W

it's a heater
it's a light
it's a warm air circulator

Now you can enjoy the immediate comfort and convenience of a uniformly warm bathroom, bedroom or nursery at a flick of a switch with Progress THERM-O-LITE—the all-in-one surface mounted ceiling Light-Heater-Air Circulator that is . . .

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Quick and Easy to Install: THERM-O-LITE attaches to any standard ceiling outlet with two circuits and standard double wall switch—no special "built-in" requirements or expensive duct work so often necessary with recessed units. *An economical, practical replacement for costly wall heaters.*

Economical to Operate: Warm air from the ceiling is drawn in through THERM-O-LITE's side vents, reheated and forced down through its attractive bottom grille by the quiet—but powerful—motor driven fan to warm the entire room. No hot blasts . . . no cold blasts. Because it is mounted on (not in) the ceiling, not one single B.T.U. of heat is dissipated out through the walls or ceiling rafters so common with recessed heating units.

Safety Safe: THERM-O-LITE is engineered with built-in safety. A fool-proof thermal link prevents overheating or mechanical failure . . . safety grille will not permit children to poke fingers or foreign objects into the element.

THERM-O-LITE is the ideal unit for any hard to heat room in the house, basement or garage—and is particularly useful in motels and summer cottages. U.L. and C.S.A. approved, THERM-O-LITE is backed by a 5 year guarantee for the motor and a full 12 months for all other parts.

PROGRESS MANUFACTURING CO., INC.
Castor Ave. & Tulip St., Phila. 34, Pa.
Please send me literature on Progress Therm-o-lite.

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Company_____
Street_____
City_____ Zone_____ State_____
Type of Business_____

PROGRESS MANUFACTURING CO., INC.

PHILADELPHIA 34, PA.

Manufacturers of Nationally Famous Lighting Fixtures — Ventilating Fans — Door Chimes — Range Hoods — Radio and Inter Communication Systems for the Home

Southern States Equipment Corporation of Hampton, Georgia recently announced the appointment of **R. J. (Joe) Phillips** as production manager.

Mr. Phillips joined Southern States in 1945 as chief inspector and was appointed assistant production manager in 1950.

Prior to his association with Southern States, Mr. Phillips served with Tennessee Coal and Iron Division of U. S. Steel Corporation. He is a graduate of Birmingham-Southern College.

Robert R. Rector, vice-president in charge of sales for the **Holan Corporation of Georgia,** manufacturer of service and line bodies and power equipment, has announced two new appointments.

O. H. Stelter, Jr., becomes manager of sales and sales engineering. A graduate of the University of Colorado, Mr. Stelter comes to Holan

O. H. Stelter, Jr.

from Koenig Iron Works where he was a sales engineer. Previously, he had been an engineer for two Texas firms and served as an aerial engineer for the Air Force.

The new district manager for Texas and Oklahoma is **Anton C. Adams,** formerly a southern sales

Anton C. Adams

representative for McCabe-Powers Auto Body Co. Mr. Adams, a University of Virginia graduate, was an Air Force fighter pilot.

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FIRST IN FEATURES!

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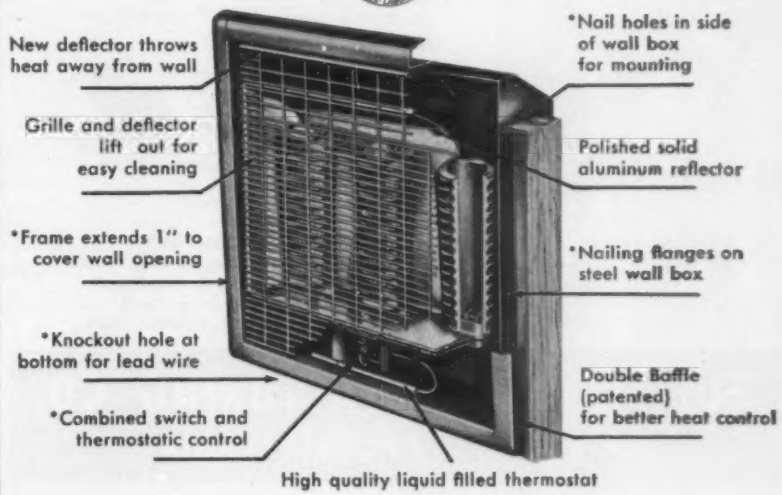

New deflector throws heat away from wall
Grille and deflector lift out for easy cleaning
*Frame extends 1" to cover wall opening
*Knockout hole at bottom for lead wire
*Combined switch and thermostatic control
*Nail holes in side of wall box for mounting
Polished solid aluminum reflector
*Nailing flanges on steel wall box
Double Baffle (patented) for better heat control
High quality liquid filled thermostat

*Saves time on installation.

Special surface mounting kits available.

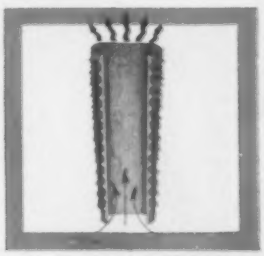
Cavalier
AUTOMATIC ELECTRIC
WALL INSERT
HEATERS

Smart styling plus extra features make Cavaliers easy to sell. The modern, forward-thrust Wall Insert shown is typical of the line. Easily installed, too. You profit from satisfied customers, fewer call-backs. Finest quality throughout. 10 Year Guarantee on heating elements. Complete selection of styles and sizes to give you the inside track on any job.

SELL WITH CONFIDENCE
. . . SELL CAVALIER!

Write for catalog and prices on complete line.

Cavalier Corporation
Electric Heating Division
Chattanooga 2, Tenn.
Quality for over 90 Years



EXCLUSIVE
Patented tapered cone construction produces 1/3 more heated air up through element.

EXCLUSIVE
Easy cleaning in 3 minutes or less. No screws or bolts to remove. Grille lifts out, hinged reflector tilts forward.

Latrobe PRODUCTS

FLOOR BOXES • WIRING SPECIALTIES

PRODUCTS

Floor Boxes • Cover Plates
Pipe or Conduit Hangers
Gang Boxes • Junction Boxes
Nozzles • Fish Wire
Cable Supports
Insulator Supports
Staples and Cable Clips

Easy to Install

There are no excess screws, wires or complicated parts in "Latrobe" Floor Boxes or Wiring Specialties. Their design and mechanism is simple, sure and compact.

That is why "Latrobe" Products are so quick and easy to install—so efficient in service.

Insulator Supports

Fasten porcelain or glass insulators to steel framework without punching holes. 3 sizes — 1", 1½", 2" and 2½".

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F. P. WALTER COMPANY
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JIM ROBERTSON & COMPANY
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ELECTRICAL ESTIMATING GUIDE

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This new, entirely different estimating guide has 175 completely worked out charts.

Authentic, Time Saving—Easy to Use

This book is easy to use—it has no complicated mathematics or formulas to work over. You merely determine the nature of the wiring, check it in the BLUE BOOK OF ELECTRICAL ESTIMATING and there's your answer—it's the simplest estimating book ever written.

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Just For Examining Blue Book

This book was written by a successful electrical contractor and estimating engineer with over 20 years' experience. It has an entirely different method of determining estimates on wiring jobs. Electrical contractors, journeymen, architects, and engineers will find use for this book every day. Gives time required to do jobs along with complete labor charges in every state in the country. Order this book now at special introductory price of $7.75. As a special offer to Electrical South readers the publishers give a free copy of the latest National Electrical Code Book just for examining the 1956 Blue Book of Electrical Estimating.

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Send me the NEW BLUE BOOK OF ELECTRICAL ESTIMATING and the latest edition of the National Electrical Code Book for 5 days free trial. I understand I may return the book within 5 days and owe nothing. If I keep it I will pay $7.75 plus postage for shipping. I keep the Code Book FREE even if I return the Blue Book of Electrical Estimating.

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(March 1958)

Technical books

Electrical raceways

"Design Manual on Steel Electrical Raceways." Published by the American Iron and Steel Institute, 150 East 42nd St., New York 17, N. Y., 137 pages, diagrams, $1.00.

The purpose of this manual is to provide electrical designers and installers with a ready source of information on basic considerations entering into the design of electrical distribution systems for industrial, institutional, commercial, and residential occupancies.

The interests of the consulting engineer, the electrical contractor, the electrical inspector and the practicing electrician have been carefully considered in the preparation of this manual. The text has been made brief and concise for easy application to everyday practical problems.

The text which was developed by eminent authorities on electrical wiring design practices reflects wide experience with, and deep understanding of, the steel raceway requirements of the National Electrical Code (1956 Edition). Where applicable, discussion also includes possible future Code revisions which may be necessary to meet the demands of modern electrical utilization.

NEMA standards

Copies of the following standards are available from the National Electrical Manufacturers Association, 155 East 44th Street, New York 17, N. Y.

"Standards for Transmission and Distribution Voltage Regulators," $2.00. Induction and step voltage regulators are covered in this revised book. Specific information is given concerning ratings, range of regulation, temperature rise, service conditions, tests, features and accessories, letter dimensions, terminal markings and cable connections.

"Standards for Secondary Network Transformers," $.80. This joint EEI-NEMA publication contains design standards for certain mechanical and electrical features of three-phase, liquid-immersed, subway- and vault-type secondary network transformers rated 1000 kva and smaller, high voltage 27,060 volts and below, low voltage 216Y/125 volts.

"Standards for Secondary Unit Substations," $3.00. This publication contains practical information

concerning the preferred arrangements, ratings, one-line diagrams and specifications for unit substations having a low-voltage rating of 1500 volts or below.

"Standards for Bias-cut Varnished Cotton-fabric Tape," $.75. Revised books have been issued on this subject — VF 3-1957 for black and VF 4-1957 for yellow bias-cut varnished cotton - fabric tapes. Both books cover testing, dimensions, physical properties, manufacture, packing, marking and inspection of such tapes.

Tape recorder manual

"Tape Recorder Manual, Volume I." Published by Howard W. Sams & Co., Inc., 2201 East 46th St., Indianapolis 5, Ind., 148 pages, $2.95.

This first of a new series of tape recorder service manuals is an invaluable book for technicians or audiophiles and is being produced to meet the increased demand for more comprehensive material on current-model tape recorders. The manual covers seven basic tape recorder chassis and two tape players produced in 1956 and 1957.

Both home and professional type tape recorders are covered. . . . . complete authoritative information includes general operation data, use of external speakers, mechanical and amplifier adjustments, cleaning, lubrication, etc. For each recorder covered there is complete information on troubles and probable remedies, plus complete mechanical and electrical parts lists.

Photos show actual recorder, amplifier. Exploded view drawing gives complete assembly and parts list information. Amplifier schematics are included where specific amplifiers are used. A complete index of tape recorder coverage in this volume and previous Sams publications is included.

New products

Plug-in magnetic circuit breaker

A PLUG-IN type, fully magnetic circuit breaker with all of the performance characteristics of its original magnetic breaker has been announced by Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn 16, N. Y. Unique plug-in design allows it to fit in load centers without wobble. Breaker can be plugged in quickly with one hand. Metal jaws on one end which grasp bus bar are recessed to prevent damage.

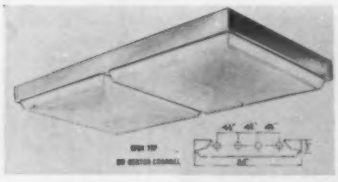
The "MP" is fully magnetic and unaffected by surrounding temperatures. It offers complete protection at all degrees of overload, never needs derating. Available in ratings from 15 through 50 amperes. A complete line of load centers with from 2 to 42 circuits has been designed to carry new breaker.

For additional data, ask for item P-301, using the coupon on page 106.

Open top fixture construction gives direct—indirect light

OPEN TOP construction of the Spacelighter, manufactured by the Leadlight Fixture Co., 800—100th Ave., Oakland 3, Calif., makes possible its use as a direct—indirect suspended fixture.

A rigid frame forms the periphery of the fixture, leaving the entire top open. Diffusers rest on a flange



around the inside bottom edge. The Spacelighter is only three inches deep. There are no striations because transformers are in side channels.

For additional data, ask for item P-302, using the coupon on page 106.

Specialty transformers mounted in any position

A LINE of dry-type specialty transformers (Type EP) that is quieter, lighter, and smaller than previous designs has been announced by Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

The units are particularly suited for application to electrical machinery, panelboards, and general commercial installations including hospitals, offices, and schools. The core and coils of the new transformers are completely encapsulated in resin with filler, providing a sealed unit that can be installed in hazardous areas.

Sealing the units in resin results in sound levels averaging 5 db below NEMA standards. At the same time,

COMING APRIL 1958

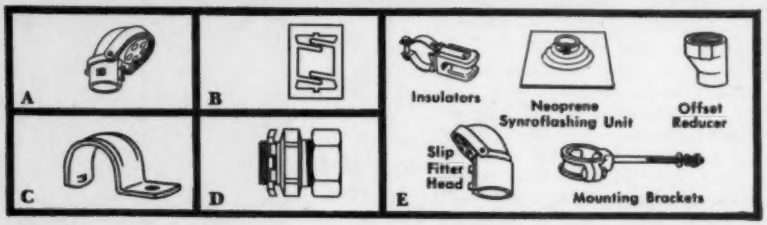
INSULDUR

New Life Insurance for Your Distribution Transformer

J-70840

YOU CAN BE SURE...IF IT'S Westinghouse

BLACKHAWK *your one best source for conduit fittings*



A SLIP FITTER HEAD made of ductile aluminum. No rusting or discoloration. Simply slip over conduit and tighten two set screws. Available in 2" and 2½" units.

B 540 BOX SUPPORT one piece box support. Provides rigid, unified support. Tabs are bent to inside of box, holding it tight. Broad, single support surface won't wobble or cut.

C SNAP STRAP snaps tighter. Has exclusive "hold bump." Ribbed bracket adds to the snap, provides rigid contact support of the conduit or EMT. Wide range of sizes. Quickly installed.

D EMT CONNECTOR has full. true, perfect threads for ease and speed of installation. Rain-tight. Finished in zinc to eliminate corrosion. Complete range of sizes.

E SERVICE ENTRANCE MAST ASSEMBLY consists of Slip Fitter Head, Synroflashing unit, Offset Reducer, Mounting Brackets and Insulators. The mounting brackets attach to vertical studding, support entire service drop strain. This eliminates water leakage at penetration point and vibration strain to rafters and roof.

Blackhawk service entrance masts, with slip fitter head and new synroflashing can be purchased as a complete kit or as separate fittings.

Blackhawk Industries, Dubuque, Iowa

Where the new ideas come from

use Test-Proven

ACCURATE TAPES

FRICTION.... RUBBER.... PLASTIC

Send today for our most recent bulletin describing details.

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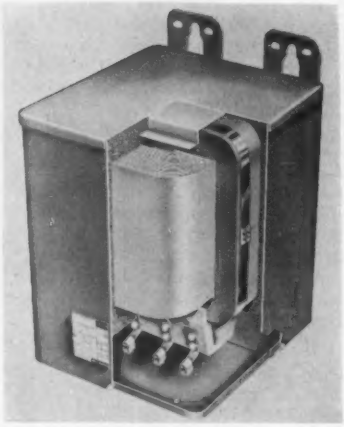
GARFIELD, NEW JERSEY



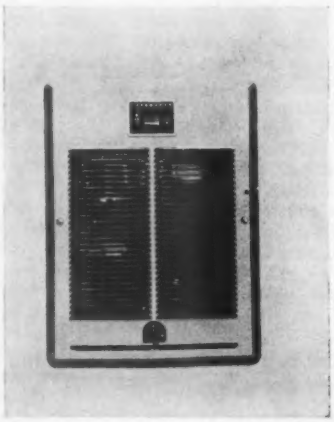
excellent heat transfer properties of the resin and filler have made possible units averaging 55 per cent smaller and 14 per cent lighter. The new transformers are available in ratings from ¼ to 10 kva, 600 volts and below, and can be mounted in any position on wall, floor, or ceiling. Ratings 3 to 10 kva are suitable for outdoor use.

For additional data, ask for item P-303, using the coupon on page 106.

Fan-type medium wattage built-in electric heater

THE THERMADOR Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Cal., has announced availability of their new built-in medium wattage fan-type electric room heater. This Model NB was designed to heat smaller rooms that usually present the most difficult heating problems.

Available in both 120 volt and 240 volt, a-c 1650 watts, 60 cycle, with manual controls or accurate thermostatic control, the new "NB" fan-



type heater is ideal for nursery, workshop, den, dinette, dressing room or larger bathrooms. The control switch is conveniently located at the top of the compactly designed unit. An improved louvre design directs the warm flow of air down-

Connecting the leads for a motor control panel, resetting a reconditioned drive motor, or running in some new bench outlets for power driven hand tools give you perfect opportunities to benefit by Graybar service. Your nearest Graybar warehouse has — ready for prompt delivery — the right product for every wiring need.

When you need supplies for WIRING your best source is Graybar

Take tape, for example. Naturally, you need guaranteed results when using friction, rubber or plastic tape. When you order one roll, a shop-package, or a case from Graybar you can count on quality — and fast delivery, anywhere.

Also, you can count on your nearest Graybar warehouse — and there are over 130 of them — for the best in insulated wire; for thinwall, heavy-wall, fibre, aluminum, steel and copper conduit — all made by first line manufacturers. Remember that whether you need tape, wire, or conduit for routine maintenance in your customers' plants or when planning the complete wiring of a new plant, your requirements can be met from the widest selection of electrical equipment available anywhere — *Graybar*.

738

WRITE FOR YOUR FREE SAMPLE

If you are located in the U. S. or its possessions, Graybar will be glad to mail you sample rolls of STICKA Friction Tape and VICTOR Rubber Tape. Write for them!

CALL **GraybaR** FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

Save time testing watthour meters with the

KNOPP

Meter-Testing Equipment, Type TE-7

Power companies the nation over, save time, save money, and build customer goodwill when testing watthour meters with the Knopp Meter-Testing Equipment.

Has Knopp Uniload† System with Unilink† series-test feature enabling testing of both elements of a 3-wire, single-phase meter simultaneously without opening the potential link.* Basic constant of rotating standard adjustable to match basic constant of meter-under-test.* Its new, more-convenient switching arrangement for connecting meter elements permits 2-element and 3-element polyphase meter testing without changing connections. Includes photoelectric counter and other time-saving features for accurate testing.

Tests all types of watthour meters. Provides voltage ranges of 120, 240, and 480; current ranges of .25, .5, 1, 1.5, 2.5, 5, 10, 15, 25, and 50. Overall equipment accuracy within .05%.

*Patented †Trademark

KNOPP Phase Shifter

You can have any leading or lagging phase angle by manually controlling the position of the rotor. One scale shows degrees for electrical angle of displacement; another, corresponding power-factor values. Gives true power-factor readings under all conditions. Highly accurate. Input: 120/240 v. 3-phase, delta. Output: 120 or 240 v. 3-phase, delta. Other ratings available.

Also: Knopp Precision Transformers; Knopp Standard Burden Sets; Knopp Uniload Equipment for testing instruments and instrument transformers.

For complete technical descriptions please write us today

KNOPP INC.

Founded in 1928 by Otto A. Knopp under the name of Electrical Facilities Inc.

Dept., A-4, 1307 66th St., Oakland 8, Calif.

wards to heat the "living zone" of the room.

For additional data, ask for item P-304, using the coupon on page 106.

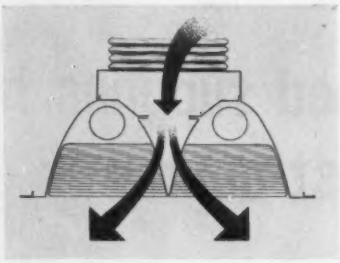
Air diffusion combined with fluorescent units

AN INTEGRATION of air diffusion and fluorescent illumination into one functional architectural element has been announced by Day-Brite Lighting, Inc., 16 North 9th St., St. Louis, Mo. The unit was developed jointly with the Barber-Colman Co., Air Distribution Division.

This Paraflo troffer can be readily installed in any suspended ceiling to provide high comfort light and air conditioning. Conditioned air is dif-

fused throughout the length of a center parabolic louver of perforated metal. The total free area of perforations provide low pressure drop and a correspondingly low noise level. The center V imparts lateral deflection to the air stream resulting in spread type diffusion.

Laboratory velocity and temperature traverses show that the units can deliver up to 150 c.f.m. at normal



temperature differentials. Conditioned air mixes quickly with room air to provide uniformity and comfort within the occupied zone of the room.

For additional data, ask for item P-305, using the coupon on page 106.

Dust tight enclosed prismatic lighting unit

HOLOPHANE CO., INC., 342 Madison Ave., New York 17, N. Y., has announced their new enclosed prismatic lighting unit UL approved for use as Dust Tight in Class II, Groups E, F and G and Class III locations. Exceptionally efficient prismatic glass reflector and refractor combination, designed for 200 watt lamps, provides 52% output in the 0°-60° zone and 86% over-all.

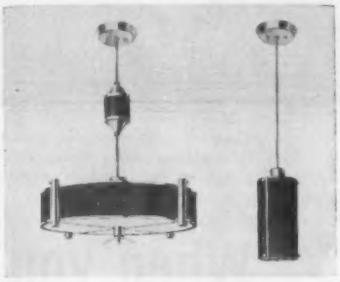
Unique mechanical holding method

supports glass member from underneath, by means of stainless steel bails and cam latches. All mechanical parts are of corrosion and weather resistant materials including stainless steel pins on which the cams rotate.

For additional data, ask for item P-306, using the coupon on page 106.

Translucent wood sheds soft glow from fixture

INTRODUCTION of five new lighting fixtures featuring Luxwood cabinet grained wood trimmed in gleaming brass has been announced by the lighting fixture division of Thomas

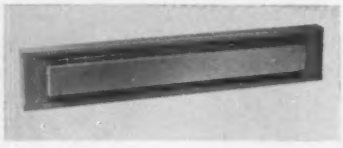


Industries, Inc., Louisville, Ky. Translucent when lighted, the rich-grained wood panels emit a filtered glow. The Luxwood line includes two close-to-ceiling units, a three-light cluster, a reel pull-down and a single pendant unit.

For additional data, ask for item P-307, using the coupon on page 106.

Baseboard heaters easily reversed

DUAL-FIN baseboard heavers, a complete economical heating system, has been added to the line manufac-



tured by Electrovector, Inc., 475 Flushing Ave., Brooklyn 5, N. Y.

Easy to install, Dual-Fin Heaters have no top and bottom so they can be reversed without disassembly. They may be installed either side up.

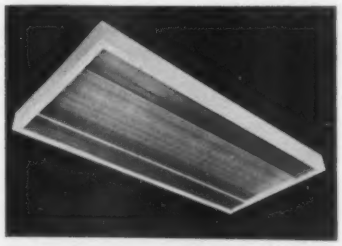
Dual-Fin provides a gentle heat which bathes the entire room in pleasant comfort.

Available with a wall mount or built in silent thermostat for individual control. Dual-Fin heating systems come in 750, 1500 and 2000 watts: 2⅞" wide, 6½" high and in 36", 72" and 96" lengths. A tan finished coat serves as a primer, can be painted any color scheme.

For additional data, ask for item P-308, using the coupon on page 106.

Surface mounted fixture with recessed appearance

DAY-BRITE Lighting, Inc., 16 North 9th St., St. Louis, Mo., has announced their new Daylume series of ultra thin surface mounted lighting fixtures. Designed to meet contem-



porary requirements for surface lighting with recessed appearance, these units are only 3¼ inches thick.

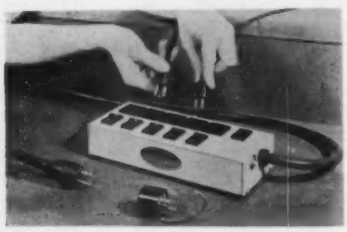
Combining 50 models in six sizes, the Daylume series is available in two, four, six and eight lamp arrangements of two or four foot lamps. Units can be wired through sides, center, or ends—for end to end, side by side, or end to side installation. Recessed back plate design assures snug alignment with ceiling. For ease of maintenance Day-Brite separable hinges allow enclosures to be hinged from either side.

For additional data, ask for item P-309, using the coupon on page 106.

Overload-protected five-outlet device

GREATER CONVENIENCE and safety for laboratory and experimental setups is offered by a new device that provides, from any single a-c outlet, five overload-protected and safety-grounded a-c outlets. The "Five-in-One Control" is available from Arthur S. LaPine and Co., 6001 S. Knox Ave., Chicago 29, Ill.

Single generators, measuring equipment and power supplies to the test set-up can all be plugged into the device.



Each of the five outlet sockets has a 15 ampere on-off switch, accepts both three-prong grounding plugs and conventional two-blade plugs.

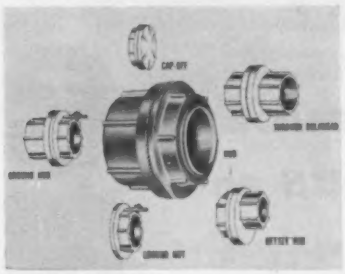
For additional data, ask for item P-310, using the coupon on page 106.

Water and dust tight seal on standardized fittings

SCRU-TITE fittings complete the standardized line of electrical fittings now offered by Myers Electric Products, Inc., 3019 South Vail Ave., Los Angeles 22, Calif.

With the ground nut, the ground hub and the offset hub, the Scru-Tite line offers unusual versatility for use in the electronics, communications, and construction industries. Sizes ranging from ⅛" up to and including 6" permit standardization within these dimensions of all conduit and/or pipe.

The Scru-Tite fittings can be installed without special tools and feature unique serrations on both nut



and hub which bite into the surface and assure full metal to metal contact and positive ground. O-ring preseated gaskets create a positive water and dust tight seal.

For additional data, ask for item P-311, using the coupon on page 106.

Wire lead improves lamp appearance

A NEW TYPE of wire lead which results in greatly improved appearance of fluorescent lamps throughout their life, has been developed by engineers of the Westinghouse Lamp Division, McArthur Ave., Bloomfield, N. J.

By means of a new process, the wire leads are black chrome plated, resulting in drastically reduced end discoloration and improved lumen maintenance. The black-plated chrome lead wires are used primarily in the inner coil support of fluorescent lamps.

The black chrome process results in a tenacious, very black protective coating on the wire which is nonmetallic in appearance. The coating will withstand unusual physical abrasion without injury. Also, it is relatively stable when operated at a high temperature in a vacuum.

Besides its use in fluorescent

COMING APRIL 1958

TOUGH PROBLEM Licked!

2-Point and 3-Point "PRA" Primary Resistor Starters at Sears Oil Co., one of nation's largest independent oil and gasoline distributors.

by New "PRA" REDUCED VOLTAGE STARTERS and *on-the-Job Service*

The Sears Oil Company, Rome, N.Y., had to control and protect large horsepower motors for pumps providing a flow into and out of storage tanks at its multi-million dollar deep water storage depot. Local power company regulations made reduced starting voltage a "MUST." Arrow-Hart was called in to solve this problem. Working with John Reed, local electrical contractor, Arrow-Hart field engineers came up with the answer — new Arrow-Hart Type "PRA" Primary Resistor Reduced Voltage Starters. Providing the necessary control and protection, they also met all local regulations governing low-voltage starting.

Small, light weight "PRA" Motor Controls, with "RA" Magnetic Starters, provide dependable, economical control. "Ribflex"* and "Edgeohm"* resistors assure correct starting current limitations. Overload relays are A-H bi-metal type. Starters can be wired for 2-wire automatic control or 3-wire push button control.

Whether your need is the *right* product for the job, or on-the-job assistance — or both — Arrow-Hart can serve you.

Write for more data on "PRA" Resistor Starters and complete information on A-H Sales Engineering Service to the Arrow-Hart & Hegeman Electric Co., Dept. ES, 103 Hawthorn St., Hartford 6, Conn.

*TRADE MARK OF WARD LEONARD ELECTRIC CO.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

ARROW AH HART

lamps, the black chrome lead wire is expected to find important applications in electronic tubes due to its stability at high temperatures and its heat-absorbing properties.

For additional data, ask for item P-312, using the coupon on page 106.

Single phase power and lighting transformers

THE HEVI-DUTY Electric Co., 2040 West Wisconsin Ave., Milwaukee 1, Wis., announces new improvements in their line of single phase power and lighting transformers. This line has 28 standard sizes of transformers from 50 va to 500 kva. These transformers have dual primary and dual secondary windings, and can also be used for 240 volt, 3 wire services.

Sound levels are low enough for indoor installations in schools, hospitals and other locations where quiet operation is necessary. These trans-

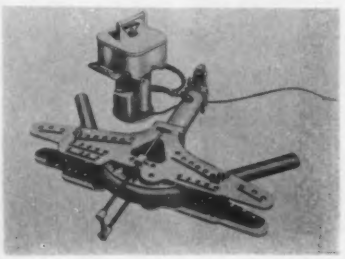
formers are also designed for optimum copper to core loss ratio. High grade non-aging silicon steel assures low operating costs.

The core and coil is well protected in a modern, well ventilated steel case. Coils are vacuum impregnated with a polymerizing varnish and are rigidly blocked to withstand internal stress.

For additional data, ask for item P-313, using the coupon on page 106.

Portable heavy duty hydraulic motor pump

TAL BENDING Equipment, Inc., Milwaukee 2, Wis., announces the development of a small, fast, powerful, portable hydraulic motor pump de-



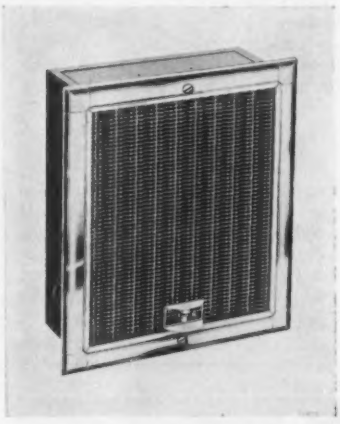
veloping up to 10,000 p.s.i. pressure and weighing only 65 pounds.

Besides being used with hydraulic benders, pipe pushers, knock-out punches, hydraulic jacks of any kind, it can readily be installed and adapted to give fast continuous power to existing equipment wherever hydraulic power is used or can be used to replace mechanical power.

For additional data, ask for item P-314, using the coupon on page 106.

6800 BTU fan-type electric wall heater

A FAN-TYPE electric wall heater of higher wattage has recently been announced by Broan Manufacturing



Co., of Hartford, Wis. This heater, the U 20, has a 6800 BTU per hour output and a rating of 2000 watts (120 or 240 V, 60 C).

Uniquely compact, its grille projects only ¼" into the room, and the 4" wall box is shallow enough for dry wall construction. It provides 10-second heating action, with a fan to distribute heat evenly and has toggle switch control.

For additional data, ask for item P-315, using the coupon on page 106.

Color coated covering for control cables

AS AN AID to circuit identification, The Okonite Company, Passaic, New Jersey, now offers in a range of colors an interlocked aluminum covering for power and control cables.

Circuit identification is easily and inexpensively accomplished using painted Loxarmor (Okonite's interlocked armor construction). The phosphate base coat and baked enamel finish combine to produce a colored coating that is extremely adherent and hard.

The Loxarmor is fabricated using an aluminum strip that is prepainted. Splices can be repainted using a primer and a fast drying lacquer as the finish coat.

For additional data, ask for item P-316, using the coupon on page 106.

ADD-ON

ARROW-HART
100 Amp.
SERVICE

... maximum flexibility at minimum cost!

Now, with Arrow-Hart's *flexible* 100 Amp. Service Equipment, you can — at low cost — provide your customer with a service unit that will meet his present — and *future* — electrical needs. Both a Small Enclosure (8 to 12 circuits) and a Large Enclosure (12 to 20 circuits) are available.

Design features benefit both you and your customer. Parts are clearly marked to assure easy, correct assembly and installation. Add-On Branch Circuits are supplied with captive screws (for positive contact) already in place. No need to rely on stab-type tension alone for attachment. Neutral strips, located to eliminate looping and U-bending, and to save wire and wiring time, can be grounded or insulated.

Write for free copy of Folder No. A-228 to The Arrow-Hart & Hegeman Electric Company, Dept. ES, 103 Hawthorn Street, Hartford 6, Connecticut or . . .

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APPLIANCE SWITCHES • WIRING DEVICES

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C-24 pres-SURE-tool features an exclusive four-way crimp which permits splicing over a much broader wire range than any other tool.

This single tool splices from 2 #18's thru 3 #8's or 2 #6's with only two sizes of Splice Caps.

Snap-on Nylon Insulators are approved for 600 volts on building wire, 1000 volts in fixtures in applications to 105°C.

The Buchanan C-24 pres-SURE-tool also terminates from 1 #16 thru 1 #8 with only one size Termend Lug.

Ask your wholesaler or write for Bulletin S-3

3T1

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MIAMI - MYRTLE BEACH, S.C.
ST. PETERSBURG - SHREVEPORT
and other principal cities

Free bulletins

Catalog EC-199, offered by the **Electromode Division** of Commercial Controls Corp., 570 Culver Rd., Rochester 3, N. Y., describes their complete line of **electric heaters and heating systems for the home.**

Descriptions, specifications, and illustrations are included for wall and portable heaters for large and small rooms, radiant panel heaters, baseboard heaters and radiant cable heat.

For additional data, ask for item B-317, using the coupon on page 106.

Request on a company letterhead will bring Bulletin SL-703 on **series street lighting transformers** from **Moloney Electric Co.,** Advertising Department, 5390 Bircher Blvd., St. Louis 20, Mo. The bulletin describes the mechanical and electrical aspects of the various types Moloney manufactures.

For additional data, ask for item B-318, using the coupon on page 106.

Excel Electric Service Co., 2121 South Western Ave., Chicago 8, has made available its Bulletin GI-574-2 which describes how a ground alarm can take the guesswork out of **fault detection on ungrounded and modified grounded electrical distribution systems.**

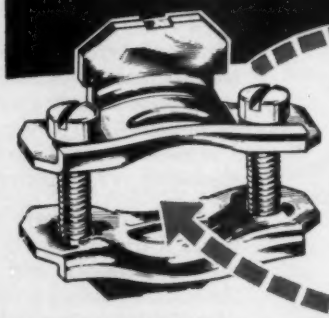
For additional data, ask for item B-319, using the coupon on page 106.

A two-volume story on **distribution transformer connectors** has been made available by **Kuhlman Electric Co.,** P. O. Box 288, Birmingham, Mich. Volume I describes types of internal connectors used in modern distribution transformers and introduces Kuhlman "coordinated crimp" connector processing. Volume II describes common types of high and low voltage external connectors and the theory of inherent resilience in connectors used for aluminum and copper conductors.

For additional data, ask for item B-320, using the coupon on page 106.

A two-color four-page folder describing new and recently-expanded **reflector fluorescent lamp** is available from **Sylvania Electric Products Inc.,** 60 Boston St., Salem, Mass. It summarizes the 15 types now included in this new line and discusses lamp uses in direct, indirect,

TOMIC Cable Connectors



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- **Handle More Cable Sizes *THAN ANY OTHER CONNECTORS***

. . . and Tomic Cable Connectors are as easy to install as they are versatile! They're installed from the outside or inside of the box—no locknuts to lose or fumble with—do the job easier, quicker, better. And Tomic's No. 100 is fast becoming America's most popular Cord Connector.

No. 100 Romex Connector for ½" K.O.

No. 200 Service Entrance and Range Connector for ¾" K.O.

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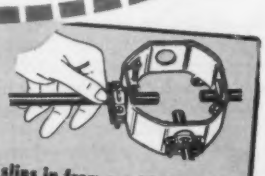

SIMPLE – slips in from outside.
QUICK – installed in 10 seconds.
CONVENIENT – for securing contacts.
DEPENDABLE – can not shake loose.

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and directional applications. Typical usages cited include areas where greater brightness is needed, where controlled light is desirable, where lamps are hard to clean, and where space is at a premium.

For additional data, ask for item B-321, using the coupon on page 106.

Ceiling illumination for schools, banks, hotels, libraries, and auto salesrooms is discussed in a bulletin, "Extended Area Lighting," now available from **Pittsburgh Reflector Co.,** 405 Oliver Bldg., Pittsburgh 22, Pa. It contains typical installations to demonstrate unusual lighting effects possible with luminous elements and provides instructions to insure that each application produces the desired footcandle level.

For additional data, ask for item B-322, using the coupon on page 106.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis., offers a new bulletin, ACP Transformers (61B7309C), which covers construction and design features of its **self-protecting transformers** in ratings 3 kva through 100 kva, 15, kv and below. The bulletin tells how transformers, which are self-protecting against lightning, overloads and short circuits, improve service continuity, reduce operating and maintenance costs, and increase revenue.

For additional data, ask for item B-323, using the coupon on page 106.

Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill., announces the availability of **"Electrical Conductor Code Names,"** a handy reference wall chart containing all past and present code name designations for aluminum electrical conductor and specifying type and size of products. The one-piece chart is printed on washable, crack-resistant plastic paper and eliminates the inconvenience of numerous reference forms, formerly required.

For additional data, ask for item B-324, using the coupon on page 106.

Features, construction details, ratings, performance data, and dimensions on both **belt- and direct-drive roof ventilators** are among topics discussed in Revised Bulletin SDA-220, available from the Fan and Blower Division of **The Peerless Electric Co.,** Warren, Ohio. Photos, line drawings, tables, charts, and graphs are freely incorporated in the revised publication, which includes a listing of all Peerless Fan and Blower representatives, their addresses and phone numbers.

For additional data, ask for item B-325, using the coupon on page 106.

A four-page brochure describing **submersible pump cable** is being offered by **Essex Wire Corporation,** 1601 Wall St., Fort Wayne, Ind. Complete specification charts give details on available sizes, conductors, strandings, conductor insulations, jacket thicknesses, nominal diameters, net weights per 1,000 feet, and suggested wire sizes for cable length from pump to control box and supply wire length from control box to load center.

For additional data, ask for item B-326, using the coupon on page 106.

A comprehensive Cross Index Replacement **Guide for fluorescent lamp ballasts** has been published by **Universal Manufacturing Corp.,** 29-51 East Sixth St., Paterson, New Jersey. Printed on heavy board stock for wall mounting, the Cross Index Replacement Guide lists more than 120 type numbers, with electrical ratings of ballasts made by five major manufacturers. Included is the number of lamps; lamp wattage; line voltage rating and manufacturer code number.

For additional data, ask for item B-327, using the coupon on page 106.

Royal Electric Manufacturing Co., Inc., 1122 East 87th St., Chicago 19, Ill., has recently released a catalog on its **electric aluminum power connectors.** Catalog No. 1 includes eight sections of aluminum connectors, and describes 158 different types and more than 7,000 new items, all of which are indexed for faster, easier selection. An extensive data section aids in estimating planning, and engineering.

For additional data, ask for item B-328, using the coupon on page 106.

Allied Radio Corporation, 100 N. Western Ave., Chicago, distributors of radio and electronic parts and equipment, announces release of its 1958 general catalog. This new 404-page catalog (192 pages in rotogravure and four-color covers) lists over 27,000 items, with special emphasis on equipment for **industrial maintenance, research,** and **production requirements.**

For additional data, ask for item B-329, using the coupon on page 106.

A two-page bulletin, "Form 406S **Fluorescent Luminaire"** (GEC-1462), available from **General Electric Co.,** Schenectady 5, N. Y., provides description of four-lamp, six-foot unit, discusses applications, and includes luminaire electrical data, photometric data, dimension diagrams, and recommendations for power groove and high-output lamps.

For additional data, ask for item B-330, using the coupon on page 106.

COMING APRIL 1958

A four-page brochure has just been published by **J. H. Holan Corp.,** 4100 West 150th St., Cleevland 11, Ohio, to describe the operating features of its new Series 6800 **power derrick.** The brochure has field photos in addition to features, dimensions and capacities for the derrick with or without extendible boom head.

For additional data, ask for item B-331, using the coupon on page 106.

A new 650-page **Engineer's Handbook** has been made available by the Tube Division of the **Columbia Broadcasting System, Inc.,** Danvers, Mass. Included are RETMA data on more than 1000 tubes, along with 300 curves, for current-, seldom-used-, and special-purpose receiving and television picture tubes, regardless of make.

For additional data, ask for item B-332, using the coupon on page 106.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis., offers its Bulletin PSE4 on **horizontal-break switches,** illustrating special features, said to make type PH two-insulator switches the economical and practical answer to switching problems.

For additional data, ask for item B-333, using the coupon on page 106.

Features which contribute to the outdoor dependability of A-C **weather-protected motors** (Type FOD) built to NEMA and ASA standards in sizes NEMA frame 505 through 800 hp at 3600 rpm are described in a new bulletin released by the **Allis-Chalmers Manufacturing Co.,** 938 South 70th St., Milwaukee 1, Wis.

The motors feature a sturdy steel frame, a removable prewound stator assembly, proven insulation, capsule-mounted split sleeve bearings, removable air ducts, and protective screens.

For additional data, ask for item B-334, using the coupon on page 106.

Utility budgets

(Continued from page 70)

Largest portion of this expenditure will go into the additional generating facilities at the Rex Brown Steam Electric Station, Jackson, where a 230,000 kilowatt generating unit is being added at a total overall cost of $25,000,000.

Major transmission projects

Among the major transmission projects scheduled for next year are:

A 115,000 volt transmission line through the city of Jackson from the Rex Brown Station to the South Jackson substation—a distance of 8 miles. This will be of modern, single-pole construction. Included will be a compact, package-type substation of the latest in design, located strategically to best serve the city's growing electrical needs.

Added expenditures on the 115,000 volt transmission line now being constructed from Brookhaven to the MP & L Natchez Steam Electric Station, a distance of 62 miles. This project is to be completed May 1958, including a 115,000 volt substation at Meadville.

Continuation of the Vicksburg-Rolling Fork 115,000 volt transmission line, now under construction, to be completed in 1959. It will include two substations—one at Vicksburg and one at the Mississippi Valley Portland Cement Company plant, under construction north of Vicksburg.

Senatobia Coldwater 115,000 volt substation and transmission line. The line will run from Como to a new substation planned for the Senatobia-Coldwater area. Work on this is scheduled for 1957 and 1958.

$3,302,950 is earmarked by Mississippi Power to be spent in 1958 for a number of jobs throughout Western Mississippi that will increase capacity and improve local distribution and service over a wide area.

Automatic recloser

(Continued from page 66)

46 kv systems was described by R. N. Yeckley and R. H. Cunningham, both of Westinghouse Electric Corp., East Pittsburgh, who described a new 46 kv low capacity circuit breaker for multiple reclosing duty.

This circuit breaker is designed for 46 kv systems and has an interrupting rating of 250 megavolt-amperes. A rated interrupting time of 8 cycles has been assigned in conformance with ASA standards. As specified the multiple reclosing duty consists of two reclosures and three trips with lockout occurring after the third trip.

The interrupter design and performance obtained with this circuit breaker is dependent upon the unique arc interrupting and insulating characteristics of sulfur-hexafluoride (SF-6) gas. The design and principle of operation of

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the interrupter used in this circuit breaker are similar to those used in the 115 kv, 1,000 mva breaker described in other papers.

Essentially, the breaker consists of three porcelain-clad pole units, each of which contains an interrupter. These are assembled on a supporting frame provided for mounting the circuit breaker on utility poles. A solenoid-type operating mechanism mounted at one end of the supporting frame is connected through horizontal rods to the pole units.

The entire assembly is weatherproof. The operating rods are in pipe housings, and a portion of the supporting frame forms a conduit for all wiring from the pole units to the mechanism housing. The associated protective relays, reclosing relay, transistor-equipped amplifier, closing power rectifier and capacitor-type tripping device are housed in a separate weatherproof cabinet at ground level.

The circuit breaker has been tested extensively in the high power laboratory and has in every respect justified the assignment of an interrupting rating of 250 mva. It has been subjected to verification tests which included fault interrupting and multiple-reclosing, momentary and four-second, 60 cycle and impulse voltage, charging and magnetizing, and temperature rise tests at rated continuous current.

The breaker is of simple construction with all parts easily accessible. The rugged and dependable design makes it suitable for a large number of operations with minimum maintenance.

Switchgear apparatus

Other discussions presented in the sessions on switchgear included a description of a 138-kv metal enclosed isolated phase bus and switching structure by R. H. Albright, I-T-E Circuit Breaker Co., and a survey of the application of aluminum in switchgear apparatus presented by R. H. Rutter and L. E. Keck, both of Westinghouse Electric Corp.

Mr. Albright pointed out there is a definite trend towards higher subtransmission voltages to meet increasing load demands in certain metropolitan areas. High voltage metal enclosed isolated phase bus structures are a practical and economical solution to the bus and switching needs at these higher voltages and offer many advantages such as simplification in arrangement, greater flexibility, and greater safety. He then described a 138 kv metal enclosed isolated phase bus and switching structure furnished for the East River Plant of the Consolidated Edison Company of New York.

The initial 138 kv installation consisted of one incoming line feeding the 69 kv switchyard through four 138/69 kv autotransformers. Provisions were made for a total of four 138 kv ties. A single line diagram of the station is shown in Figure 1.

A space 62 feet by 162 feet was available for the 138 kv station and transformers. After providing for the transformers, the space available for incoming line compartments, buses, and switches was 34 feet by 162 feet. In addition to the 138 kv station occupying this space, six 69 kv circuits four present and two future) with breakers, disconnects, line compartments, and buses were to be included. The limited space made it necessary that all 69 kv equipment and the 138 kv line compartments be installed at ground level with the 138 kv bus and switching on several levels overhead.

Design objectives

The objective was to design a high voltage isolated phase bus and switching structure for 138 kv service which provided all of the desirable features of lower voltage isolated phase bus and switching structures, and which satisfied service requirements. To achieve this objective, the buses and switches had to be designed for a continuous current of 1200 amperes and withstand a momentary current of 60,000 amperes; the assembled bus and switches had to be capable of withstanding 310 kv, 60 cycles for one minute; and the equipment exhibit no measurable corona or static discharge when operated at 145 kv, 60 cycles (85 kv line to ground).

Mr. Albright explained that there were numerous problems encountered in the design of this installation. These included design of a supporting structure, construction of bus housing assemblies, construction of switch assemblies, design of insulator supports for bus and switch parts, adjustments for alignment of bus and switch housings, gasketing between housing assemblies, and design of terminations at transformers.

The author concluded that the metal enclosed isolated phase bus with telescoping blade switches as described is a practical and economic solution for high voltage bus and switching structures in areas where open type switchgear is not acceptable. The design is applicable to a multitude of bus and switching arrangements and requires a minimum of space. It provides high mechanical and dielectric strengths in weatherproof enclosures to assure continuous and prolonged service with minimum maintenance.

Aluminum applications

Westinghouse engineers R. H. Rutter and L. E. Keck in their paper on aluminum in switchgear apparatus reviewed its use both as structural parts as well as conductors.

Application of aluminum, they said, has been made as the exterior material for outdoor switchgear assemblies and in the fabrication of outdoor substation structures to reduce the maintenance expense for these structures. Switchgear assemblies of high current ratings, such as station-type cubicles, have been built of aluminum to reduce weight and obtain non-magnetic properties where needed.

Buses and connections of high-strength aluminum alloy are now being widely used in assembled switchgear. Current ratings have been established, and joint treatment and corrosion problems of aluminum bus have been satisfactorily solved.

The availability of aluminum is a very important factor in planning the future of switchgear apparatus. With the future predicted growth of the electrical industry it becomes apparent that large quantities of aluminum must be used for electrical conductors since indications are that the production facilities of other conductor materials will not be able to keep pace with the demand. Also, in times of national emergencies, there are extreme shortages of copper for conductors and copper, nickel, chromium and manganese for producing non-magnetic and corrosion-resistant materials. With the ever-increasing facilities for producing aluminum, it appears that there will be an ample supply during such times.

Fast action recloser

With development of a new rapid action reclosing device, more dependable electric service is promised in both rural and urban

for the LONG PULL use
Y-ER EAS
Wire Pulling Lubricant
Only Y-ER EAS has all these features
Write for descriptive booklet
• Creamy, non-corrosive lubricant. Never greasy or messy.
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sections, reported W. C. Wiechmann, of Line Material Industries, McGraw-Edison Co., Milwaukee. He said that the newly developed device can restore interrupted electric service in 2½ cycles, or slightly more than 1/30th of a second.

Studies have shown that 80 to 90 per cent of faults occurring on a grounded electrical system can be cleared by one or two fast tripping operations with a short period of open-circuit time between tripping and reclosure. A study of 5,000 volt systems showed that 42 per cent of the faults on an ungrounded system were of a temporary nature. While rapid action reclosers have been used on rural systems for some time, only recently have reclosers had sufficient loads carrying an interrupting capacity to be considered for urban use.

The new recloser has been developed to serve larger loads and to interrupt greater fault currents in urban as well as rural circuits, he said. He pointed out that it can be used also in industrial areas up to 14.4 kv.

Application of this new recloser involves knowledge of the system load, fault currents, and coordination characteristics. Coordination with fuses and protection against conductor damage is enhanced by rapid clearing speed. Time-current characteristics closely parallel those of other reclosers or relayed breakers so that selective coordination with these devices is possible.

Accessory equipment has been developed to enable the recloser to be applied where special controls are required. Ground-fault tripping, thermal and differential protection of transformers, shunt tripping and blocking, and remote supervisory control are all practical.

Capabilities of the new 2½ cycle recloser have been proved under severe testing. The basic self-contained operating design has been retained because lower first cost and subsequent long life will spread the available capital investment funds further. The recloser is ready to take its place as newest in the line of development which has characterized the automatic circuit recloser.

Substation practice

(Continued from page 61)

installations was only eight, but the average length of usage was 271 days. These installations were necessitated by delays in installing permanent facilities, the delays being caused by difficulties in securing substation sites or construction permits, heavy work schedules, and slow equipment deliveries.

The highest percentage of usage has been on maintenance work on major equipment. Mobile units were also used most frequently on this work. They have proved particularly useful on the longer and more important maintenance jobs such as the overhaul of transformers.

Contrary to the experience of many other utilities, there have been no occasions for serving individual temporary loads. One special use not previously referred to was that of energizing a new 138 kv line for purposes of conducting inductive interference tests prior to placing the line in service.

The summary of usage shows that the five units have been in use slightly more than half of the time. Usage of this extent indicates the desirability of, and need for several units to meet various requirements. Even though the equipment may be needed only infrequently for emergency purposes, the importance of that need justifies having one unit on standby for emergencies as much of the time as possible.

Sub-floor ducts

(Continued from page 42)

inches through placement of lateral secondary duct work in the structural floor slab, thus permitting a bonus of at least one extra story on a typical 20-story building and reflecting first-cost savings in foundation, footers, structural steel and wall building materials.

In addition to first-cost savings, there reportedly can be a yearly continuous saving for the life of the building from reduced heating and cooling units, as well as from electric power for moving air throughout the building. This power-saving is accomplished by a unique system of static pressure regulators which permits reduction of operating costs up to 40 per cent by cutting down power during off-peak seasons.

Demand is anticipated

Company officials anticipate tremendous response in the future from the air conditioning industry, since, it is felt, Q-Air-Floor will encourage owners to install air conditioning. Prohibitive costs former-

ly involved in air conditioning installation have now been largely eliminated through introduction of the new system.

Likewise, architects and rental agents may be expected to welcome Q-Air-Floor. Its small, close-to-the-floor outlet boxes (scarcely larger than the baseboard itself) will no longer interfere with efficiency and usefulness of their rentable areas.

To test thoroughly the Q-Air-Floor principle during the four seasons, Robertson recently completed a modern "show-case" office building, immediately adjoining its plant in Ambridge, Pa. Here, visiting architects, contractors, and engineers are encouraged to look behind scenes and probe the inner workings of the Q-Air-Floor system.

To demonstrate its effectiveness, an elaborate and complex control panel enables visitors to take readings of such things as air velocity, humidity, and temperature, and to see the system's functions accurately recorded throughout a season's cycle.

The firm's unique office building, in addition to Q-Air-Floor, introduces other up-to-date developments in its permanent color building materials.

Understanding vectors

(Continued from page 76)

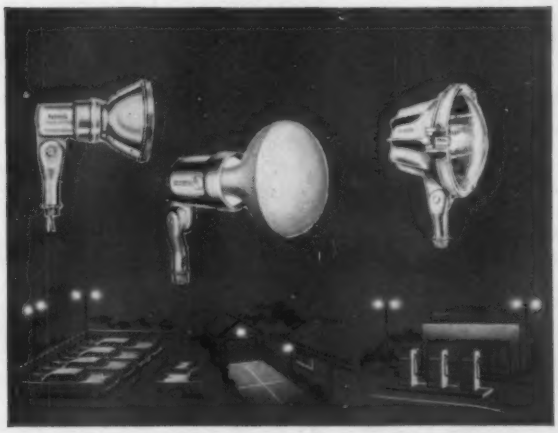
a way as to obtain secondary currents in phase at the relays in the case of an internal fault which also results in series connections for an external fault as noted for bus differential protection.

The phase relations of the transformer terminals, based upon connections such that the phase sequence corresponds to an ascending order of terminal subscripts, are shown in the inset. The vectors in the inset were taken directly from the transformer nameplate; they show the high side leading the low side by thirty degrees. However the actual connections, taken from a construction drawing and checked in the field against conductor arrangement, are such that, on the high side, the system phase A is connected to the terminal H_3 and phase C to H_1 and similarly with the low side.

Referring to the vector diagram from the transformer nameplate, it is seen that if the phase sequence applied is opposite to that of an ascending order of terminal subscript numbers, the low side will lead the high side, which it does in this case. The following procedure is one method of determining the delta C.T. connections for matching those of the wye connected C.T.'s:

Draw a vector diagram of the transformer phase relations, including the system phase marking, as shown in Fig. 24. Recall that phase relations must be such that the currents from each set of current transformers must be in parallel at the relays for an internal fault in order to be in series for a fault outside the zone.

On the delta side of the transformer, the wye connections of the current transformer secondaries can be made with only the matter of relative direction of current flow in mind, such as into the protected zone. Considering first the generator, one notes that the set of current transformers next to it determine one boundary of a zone that overlaps the generator differential zone. Also that polarity marks are toward the generator.



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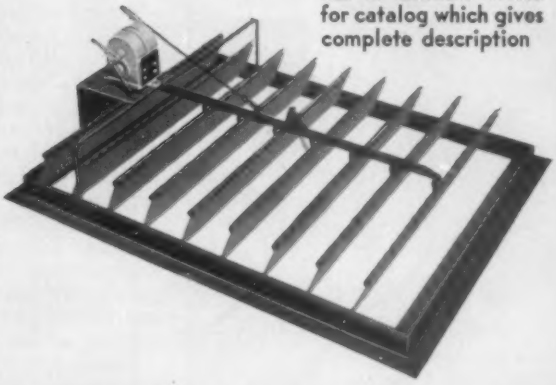

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This is the set to be connected wye.

The requirement now is to connect, at each relay, a C.T. secondary lead from delta connected C.T.'s, that will be in phase with the corresponding phase of the wye connected sets in the case of an internal fault. Consider input to the transformer from the high side for selection of polarities. Since the "A" lead of the bushing C.T.'s has the same polarity as the top of the bushing, and since thirty degrees is the smallest possible displacement, the "A" lead (or the lead nearest "A" in case "A" is not used) must be matched against the corresponding phase lead from wye connected sets, regardless of whether a thirty degree lead or lag is required.

Note from the vector diagram of the transformer that the low side leads the high side. Then the delta connection must be made up in such a way that the resultant current to the relay must lead the current in the C.T. primary.

At the vertices of the delta triangle of Fig. 24 draw bisectors of each angle and extend them outward from the triangle: these bisectors show the vector positions of the low side C.T. secondaries as applied to a wye connected load; such a load is the relays.

Consider the phase A lead from the wye set, and note that the high side resultant A minus B will be in phase with it; consider phase B and note that the resultant in phase with it is B minus C, and that the resultant in phase with C is C minus A which constitutes the only pair left. Translated into connections this means that phase A of the delta set must be obtained by connecting the bushing current transformer lead B_1 to D_1; phase B by connecting B_2 to D_2; phase C by connecting B_3 to D_3.

In checking a connection such as the above in the field it is suggested here that one use a yellow crayon and mark the prolongation of the delta vertices on the print; then mark the "minus" quantities by dotting in the reversed position of the current vectors of the wye vector; the resultants in phase with the prolonged vertices are then quite apparent.

Reverting to the subject of a simplified method of ascertaining power transformer connections, mentioned in a preceding installment of this series, the simple method just illustrated for making delta connections of current transformers can also be applied to power transformers.

Challenging job

(Continued from page 87)

We have found our experience in this, theatre work in town, and in high school auditoriums supplement each other helpfully. In theatre jobs sound equipment, dimmers and power for air conditioning were among the requirements, similar to today's high school auditoriums.

In one theatre job where it was vital to get color changes on the curtain to the precise dramatic effects the architect wanted, we did some experimenting. Cove lighting in dimmers, in red, green, blue and white, changed the ceiling and curtain colors. Indirect cove lighting in the theatre consisted of lumiline lighting of tubular type incandescent lamps of 1600 amperes. We have found that incandescent serves best for soft lighting effects.

Using an 800 ampere service, three-phase, 220 volt in one of the new high school auditoriums, we had all conduit built into the walls during construction. In a rewired theatre we pulled small diameter TW wiring through existing conduit.

Experience in a variety of exacting conditions with sound and dimmer lighting invites new vistas in this fascinating and developing field.

SEWA Meeting

(Continued from page 34)

Consignment, Mr. Menger stated, was started some 60 years ago when the economic situation was vastly different than it is today. Then, consignment helped the distributor to sell-off the slow-moving items which, by the day, were multiplying.

Without consignment, we find that the distributor takes a greater interest in his business, Menger added.

His company, he emphasized, is now taking into consideration the seeming business fall-off, and is happy to work out feasible credit terms with the wholesaler.

Conduit warehousing is presently not advisable on a regional basis, he stated, and wholesalers should consider savings involved in the ordering of full car-loads, as opposed to partial car-loads.

"The manufacturer, contractor and distributor are today concerned about certain problems which they mistakenly consider to be peculiar to their respective fields," Howard Farley, of Anaconda Wire and Cable Company told the distributors. "The manufacturer is forever suspicious that the distributor is not properly representing his products, while the distributor suspects the manufacturer of selling direct to the contractor. The contractor, in turn, complains about the manufacturer's 'take-off' allowed the wholesaler, and worries about the latter's credit discount policy extended him.

"There is only one solution to the problem," Farley emphasized, "and that is in *selectivity*. Manufacturers must become selective of their distributors, choosing those who represents their products at the best possible level. Distributors must become selective in choosing their manufacturers, singling out those who provide the best service and maintain the best warehousing facilities. In turn, the distributors must be just as selective of their contractor-customers."

He pointed out that Anaconda presently does 50 per cent of its business with 10 per cent of its customers, and 90 per cent of its busi-

ness with 15 per cent of those customers. A distinct indication that selectivity is the key success factor in business, he concluded.

Friday morning's session was concluded with a brief, but most comprehensive presentation entitled, "Economic Changes—Past, Present and Future," by Charles T. Taylor, assistant vice-president of the Federal Reserve Bank, Atlanta. His remarks covered economic activity involving the nation's capacity to produce, labor supply, financial resources, increased prices, general elimination of shortages, government expenditures, and policies of monetary and credit actions of the Federal Reserve Bank.

Apprentice training

(Continued from page 29)

that they did not understand or would like to see repeated. They are free to criticize each other's performances in the classroom.

Since these Saturday classes are continuous throughout the year, we cover a great deal of ground and can hold refresher classes. We let the apprentices pick the subjects they wish reviewed. The sessions give the men good preparation for taking their journeyman examinations.

At this point the reader will ask how many apprentices I retain after I have trained them. I do not consider the answer an index to the practical value of the course. Of course we lose good mechanics in the wage competition of the electrical trade to other contractors. But I frequently inherit good mechanics from them too. Nevertheless, it gives me a great feeling of satisfaction when a contractor comes up to me and remarks, "I just got a fine mechanic from your company. He says he was trained by you." I know I am on the right track in conducting a course for apprentices.

Our apprentices are given a trial period of one month when they are taken on. Starting at $1.25 an hour, an apprentice has his hourly wage rate increased in accordance with ability.

It is my belief that only these schools within an organization can meet the problem of building up skilled labor pools. When we give apprentices the satisfaction of knowing they can carry out jobs to the complete acceptance of a master electrician, they will have pride in their skill and confidence in their own ability. They will not drift into other trades because we failed to hold them.

Code discussion

(Continued from page 84)

circuits, we proceed with an explanation of the intended manner of determining branch circuit loads.

To determine the branch circuit load for lighting and appliances, the Code sets up four basic minimum requirements as follows: (a) The watts-per-square-foot basis. (b) The unit-load basis. (c) The modified unit-load basis. (d) The alternative basis for additions.

The watts-per-square-foot basis. In all occupancies listed in the first column of the table in section 2203, the minimum watts listed in column A of the same table is required to be installed on a watts-per-square-foot basis. That is, not

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less than the number of watts listed in column A for the type occupancy in question is to be installed.

The unit-load basis. If the occupancy in question is not listed in the table, then the unit-load system is to be used. That is, 1½ amperes must be allowed for each ordinary general-use outlet: 5 amperes for each heavy-duty lampholder; and the actual ampere rating of the appliance for all specific appliances. Motors have special requirements which we will take up separately in later issues of ELECTRICAL SOUTH.

The modified unit-load basis. This method may be used for ranges, show-window lighting, and multi-outlet assemblies. Range circuits are determined in accordance with table 29 and will be discussed separately in a future issue.

Show-window lighting may be determined by either the unit-load method or by the linear-foot method. If the unit-load of each outlet is used, the total load so computed must be increased by 25% because it is on for long periods of time.

In lieu of this method, a flat 200 watts per linear foot of show-window space may be taken as the total load for determining the number of branch circuits required. This load, when so determined, is not required to be increased by the 25% factor. (For feeder sizes also a load of not less than 200 watts is required to be included for each linear foot of show window).

Multi-outlet assemblies, as well as show-windows, may be determined by the unit-load per outlet, or such assemblies may be determined on a modified basis. On the modified basis, each five feet or major fraction thereof of the assembly is allowed to be considered as only one outlet of 1½ ampere capacity. Unlike show-windows, this assembly, when computed on a unit-load per outlet basis, does not have to be increased by 25%. But when computed on the linear-foot basis, if a large number of appliances are to be connected to it simultaneously, then each one foot must be considered as an outlet of 1½ ampere capacity.

The alternative basis. This method is permitted on additions or extensions. That is, when adding circuits to existing buildings, or extending existing circuits in such buildings, either the watts-per-square-foot basis or the unit-load basis may be used to determine the branch circuit load.

This alternative basis, however, has two exceptions. In dwelling occupancies when wiring new additions to the building or when wiring portions of such buildings which had not been wired previously, the watts-per-square-foot basis is required to be used if such areas to be wired exceed 500 square feet.

Miscellaneous additional requirements. In addition to the circuits derived from one of the above methods, at least one 20-ampere small-appliance circuit is required for the cooking-eating-laundering areas of dwelling occupancies. Loads for all branch circuits which are to be on for long periods of time must be increased by 25% for determining the number of circuits except for those permitted to be computed by the modified unit-load method. For lighting units employing transformers, auto-transformers, or ballasts as well as lamps, the load must be computed on the total ampere rating of such assembled units rather than on the wattage of the lamps only.

Recommendations. These are minimum standards. Good practice, however, requires that consideration be given to such factors as wall and ceiling insulation where heat dissipation is greatly reduced. There are times when wire embedded in such insulation should be derated as much as 50%. Some thought should be given to 220-volt circuits, such as air-conditioning units. Heavy appliances are coming into more and more use, and certainly more than one small-appliance circuit should be installed in most residences.

This month we have a question for discussion which has been brought up frequently by both inspectors and contractors. Inspectors, as a rule, seem to be concerned lest the ruling in question be misconstrued and violated. Contractors usually wish to have the ruling clarified. Often there has been a misunderstanding between inspector and contractor. As stated here, this is really a double question.

Answers to Code test questions are as follows: (1. **F** section 2116-c-4) (2. **F** sec. 2121-a) (3. **T** sec. 2121-a) (4. **F** sec. 2121-b) (5. **T** sec. 2121-c-2) (6. **b** sec. 2121-c-2) (7. **c** sec. 2122-b) (8. **c** sec. 2123-a) (9. **a** sec. 2123-b) (10. **a** sec. 2125-b).

Moving sidewalk

(Continued from page 27)

Couplings link pallets

Passengers stand on a rubber carpet fastened to individual 24-by 42-in. pallets, linked together by universal couplings. Pallets are mounted on 4½-in. diameter rubber-tired wheels which run on a steel track. Three 30-hp electric motors, located under the terminal building, transmit power through lugs on a sprocket chain, which engage the underside of each pallet. The rubber carpet pulls no part of the load, but is used only as a cover over the pallets to give passengers a smooth platform to ride on. It is made of solid rubber and contains no reinforcing fabric like that used in conventional conveyor belts.

The shortest of the three "Glide-Ride" units is 218 feet in each direction, and is installed in the north corridor. The units in the east and west corridors are 250 feet long, each way. All carpets are 42 inches wide, permitting pedestrians to ride two abreast. Corridors are completely enclosed and air-conditioned. The "moving sidewalks" rise on a gentle grade from each end so that their center sections are about 8 feet higher than their ends. This provides an underpass to permit trucks and other service vehicles to drive under corridors.

Official predicts changes

Commenting on this new development in transportation, President Thomas Robins, Jr., of Hewitt-Robins, predicts rapid growth in use of "moving sidewalks" at air-

ports, shopping centers, subways, museums, railroad stations, and large manufacturing plants. Architects, says Robins, are even now studying how to convert congested downtown streets into areas exclusively for pedestrians, with automobiles blocked off and "moving sidewalks" to transport people. Executives of many major airports and airlines are considering installation of passenger conveyors to reduce distances which passengers are now required to walk because of extensive terminal areas, made even larger for use by jet planes, he says. Hewitt-Robins engineers have developed designs for air ports in New York, Chicago, Minneapolis, St. Paul, Birmingham, St. Louis, Oakland, Los Angeles, Atlanta, Detroit, San Francisco and Philadelphia.

Officials at some of these fields are considering "moving sidewalk" in connection with current expansion and modernization programs, while others are including them in long-range plans.

Robins maintains that extensive experiments demonstrate the "Glide-Ride" conveyors to be safe, practical, and efficient for handling pedestrian traffic. They will become as commonplace as elevators and moving stairs, when architects and engineers fully realize their usefulness, he believes.

"Educated guess"

(Continued from page 44)

we hadn't the means to handle the reel. We were fortunate in being able to borrow the equipment to run the cable off the reel, and were able to get off the hook profitwise."

Anderson is a contractor who operates on the principle that success is measured largely by the net profit that can be derived from a job. But circumstances occasionally require modification of this viewpoint as in the case of the Venice Hospital job.

Anderson had asked a 30 per cent mark-up on all material plus $4 an hour labor rate. The hospital authorities countered with an offer of a fixed fee of $1,000 if Anderson would supervise the installation and supply the help. And they would pay his labor costs on a weekly basis. He acted as the hospital's agent in purchasing the needed material, although a good deal of the supplies came through via surplus stocks provided through the Florida Development Commission. This meant that Anderson supplied about $200 a month in supplies.

Naturally, since the hospital's funds were meagre, profit on the wiring was similarly slim. But, says Anderson: "It was a prestige job and it will bring me a lot of good publicity for a long time." Besides, this contractor feels it's a poor citizen who lives in a town and does nothing to advance its interest.

Multiple changes

(Continued from page 26)

four chandeliers of hand-shaped cast brass and polished crystal in Regency decor, ranging from eight to 14 feet in diameter.

Seymour Lighting of Miami installed all of the standard routine fixtures and some of the decorative units in a contract running over $100,000. There are about 5,000 individual fixture outlets with incandescent units making up 70 per cent of the installations and the balance in slim-line fluorescents. Over 900 round recessed incandescent fixtures were used with perforated vertical baffles giving a soft pinkish tint to the light. This was a selling point for a resort as it enhances the winter tan most of the guests are trying to acquire.

On the facade of the building there are eighteen 500-watt floodlights with special color lenses also creating an area of iridescent lighting which is at the same time flatteringly soft and still bright enough for all practical purposes. Effective and artistic under-canopy entrance lighting is provided by 64 special hanging bell-type fixtures of an elongated pattern. Where there is a great deal of high wind in an area, these "bells" can be secured with multiple chains as an integral part of the design, or even better they can be rigidly connected to the canopy to avoid excessive swinging.

Corridor lighting on all floors above the basement is by special recessed fixtures with drop lenses and perforated collars made by the Belmar Company. Kitchens and basement corridors employ standard slim line.

There are no ceiling fixtures in the bed rooms and portable lamps are generally in use. A small two-way through-wall glass panel lights both the inside of the clothes closet and the entrance to the bath room. The latter room has a plastic-shielded V-shaped fluorescent corner unit over the mirror.

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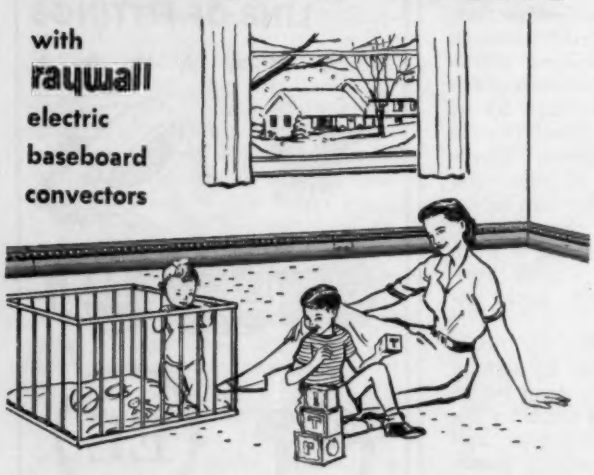

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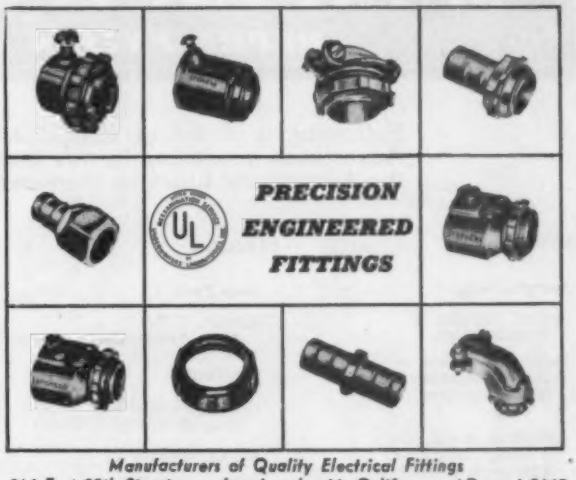

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ONLY SQUARE D GIVES YOU ALL 5

1 *QUICK* INSTALLATION!

No groping or fumbling. Square D gives you lots of wiring space, plenty of knockouts, handy and clearly marked pressure wire connectors.

2 *TOP* PERFORMANCE!

No needless downtime from coil burnout, mechanical binding, contact freezing. Square D gives you an extra-capacity magnet with a tough and cool-operating encapsulated coil to handle additional poles and interlocks—a guided single moving part—big silver cadmium-oxide contacts with strong finger springs—arcing yokes on larger sizes.

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No starter is "maintenance-free." But Square D makes the job easy. Inspection is a breeze. You don't have to remove wiring for contact replacement or take the starter out of the enclosure to change coils.

5 *WIDE-RANGE* ADAPTABILITY!

No need for excessive inventories to avoid costly waiting for non-standard arrangements. Square D provides "off-the-shelf" kits for changing contacts and coils, adding pushbuttons, selector switches, and up to 4 double-throw auxiliary circuits.

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Please send me your new bulletin with detailed proof that Square D offers me my best starter investment.

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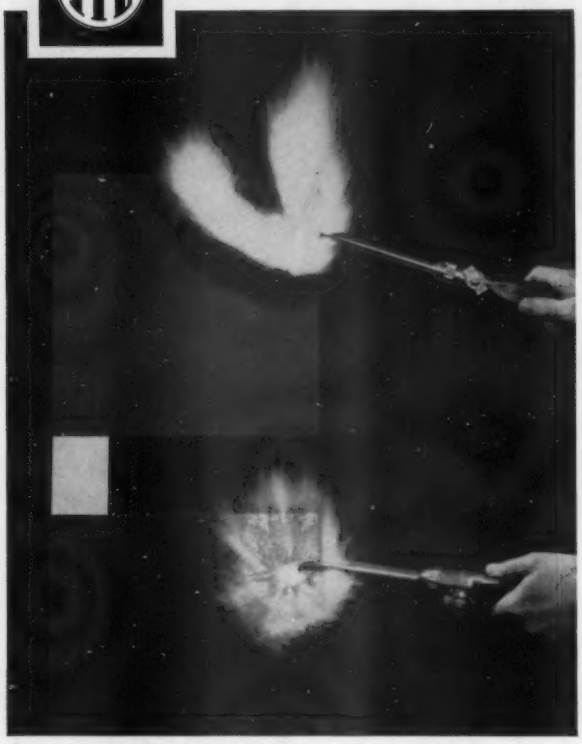
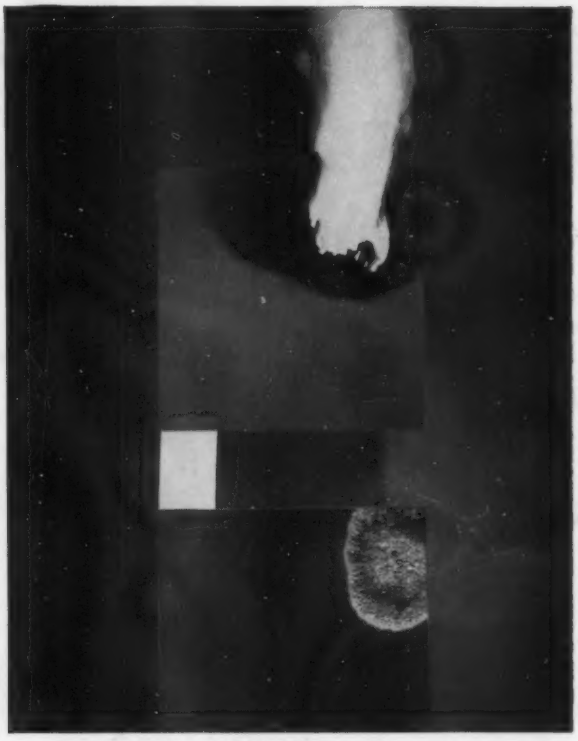
METAL-CLAD SWITCHGEAR



TORCHES IGNITE FLAMETRAP (bottom) and conventional insulation (top) simultaneously.



SECONDS LATER, FLAMETRAP has snuffed out, but conventional insulation still burns briskly.

New FLAMETRAP Insulation Snuffs Out Flame ...No Toxic Gases...Highest Arc Resistance

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